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THE FEBRUARY SCIENTIFIC MONTHLY

EDITED BY J. MCKEEN CATTELL

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THE SCIENTIFIC MONTHLY

FEBRUARY, 1927

CARL AKELEY AND HIS WORK

By Dr. CLYDE FISHER

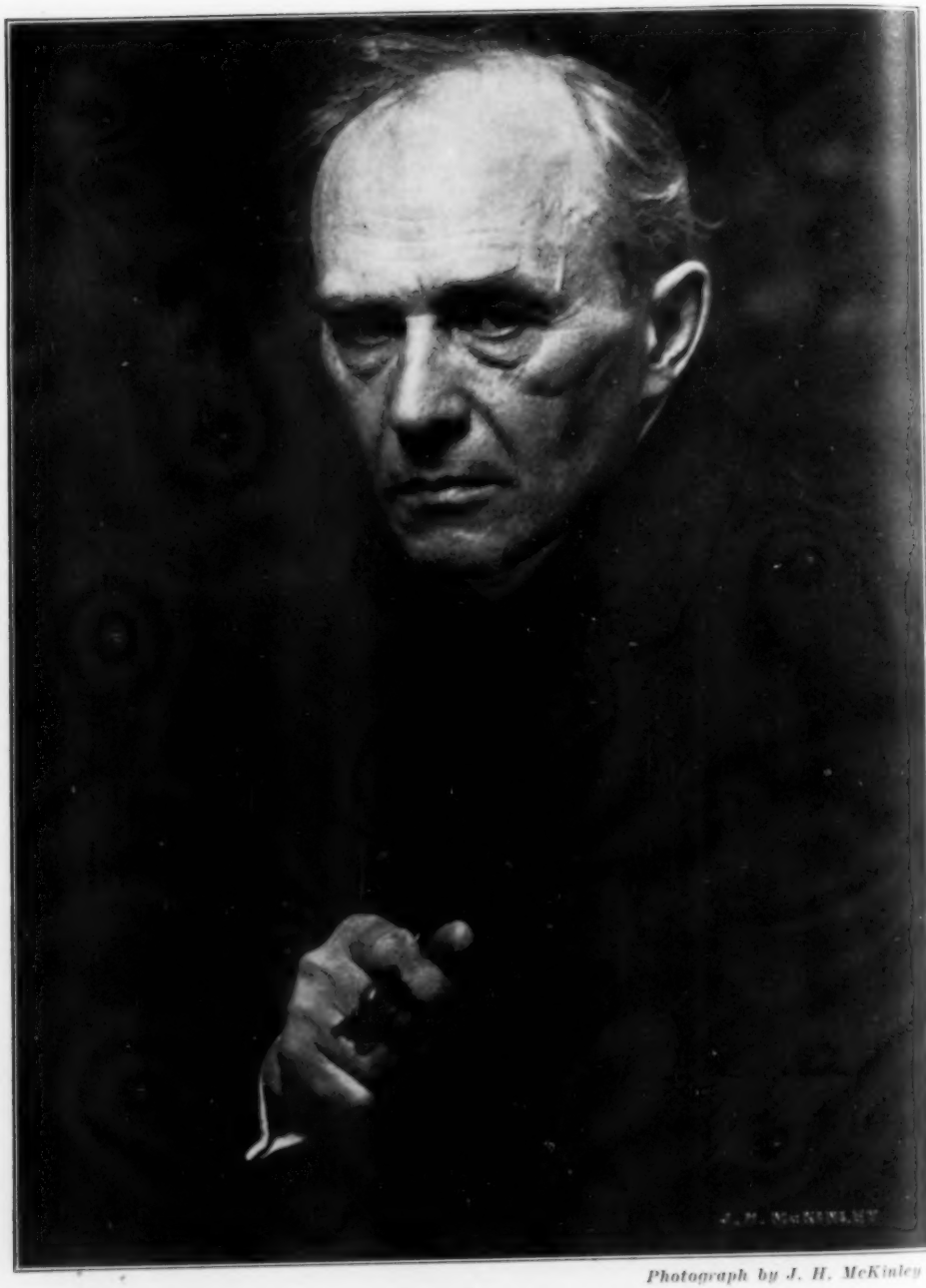
AMERICAN MUSEUM OF NATURAL HISTORY

CARL AKELEY has gone, his spirit having passed on November 17, 1926, on the slopes of Mount Mikeno in the interior of "Brightest Africa," the continent he loved best. This news brought deep sorrow and a sense of great loss to hosts of devoted friends scattered over the length and breadth of the country and to the far corners of the earth. Coming in the prime of his busy life, the end seemed so untimely and so tragic. But Akeley put more into threescore years than most men do into fourscore. He remembered to live, and he did not fear the great adventure of death. "Only those are fit to live who do not fear to die; and none are fit to die who have shrunk from the joy of life and the duty of life," was as truly Akeley's philosophy as it was of his great friend who wrote the lines.

Born on a farm in Orleans County, New York, he says: "By all the rules of the game I should have been a farmer,

LION AND CAPE BUFFALO

BRONZE BY AKELEY SHOWING A LION PERFORMING THE AMAZING FEAT OF PULLING DOWN A CAPE BUFFALO. THIS PIECE OF SCULPTURE WILL SUPPLEMENT THE STORIES OF THE HABITAT GROUPS IN THE AFRICAN HALL.



Photograph by J. H. McKinley

CARL E. AKELEY IN SERIOUS MOOD

A FRIEND HAS SAID, "TO ME THERE WAS ALWAYS AN UNDERCURRENT OF DEEP SADNESS IN HIS FACE, HOWEVER MUCH IT LIGHTED UP WITH HIS FRIENDLY SMILES."

but for some reason or other, I was always more interested in birds and chipmunks than in crops and cattle." At about the age of thirteen he saw in the *Youth's Companion* an advertisement of a book on taxidermy which cost a dollar. Later he was able to borrow a copy from one of the older boys of the neighborhood. That book was probably a determining factor in his life. At any rate he became the world's greatest taxidermist, raising taxidermy to an art, and developing a method which is without doubt one of his greatest contributions to mankind. The many other products of his versatile brain, great though they are, seem to be only supplementary or complementary to his great art.

In order to enlarge his taxidermic book-lore, he took a few painting lessons from a lady in a village near his father's farm, for he conceived the idea of painting realistic backgrounds for his mounted birds and animals. So far as known, Akeley's early attempts in this direction were the first experiments with painted backgrounds for taxidermic groups.

At the age of nineteen, upon the advice of a newly-made English friend, whose hobby was taxidermy, he went to Rochester, New York, and applied for work at Ward's Natural Science Establishment. During that period this was a famous institution for the collection and distribution of specimens for museums and for the training of museum curators, and further it was the headquarters of taxidermy in America.

In his autobiographical sketch (*Mentor*, January, 1926), Akeley tells us that he hardly slept a wink the night after he had decided to take his friend Bruce's advice and go to Ward's. Rising early the next morning he walked three miles to the railway station to catch the train for Rochester. Vividly he relates how he traversed most of the streets of Rochester, his courage sinking lower and lower, before he finally found the great arch, made of the jaws of a sperm whale, which marked the entrance to the establishment, and how when once on its threshold he was so overcome with awe that he had to walk a mile or so back and forth to screw up nerve to ring the professor's bell.

As a result of this visit Akeley was offered a position at the munificent salary of three dollars and fifty cents a week. He found a boarding house where he could get a room and meals for four dollars a week, and on this basis he began to learn the art of taxidermy and to run through his slender resources.

At that time the profession which Akeley had chosen as "the most satisfying and stimulating to man's soul" was neither scientific nor artistic as it was practiced at Ward's or anywhere else in the world. To mount a deer skin, for example, was a simple process. After being soaked in a "pickle-bath" containing salt and alum, and then poisoned with arsenical soap, the skin was hung upside down, the bones replaced in the legs, and the body stuffed with straw. Then to make the body thinner at any point, it was sewed through with a long needle and drawn in. The results of such upholstery can easily be imagined, and, of course, they did not satisfy Akeley's dreams, even those of his boyhood. Akeley made some drastic attempts, while at Ward's, to improve the crude methods of taxidermy, but these for the most part were not adopted, for the reason that no one would then pay for better work. As Akeley says: "Museums then were interested exclusively in the collection of scientific data. They preferred bird skins to bird groups and wired skeletons to mammal groups, and cared little for exhibitions that would appeal to the public. Professor Ward had to set a price on his work that the museums would pay."

Not being able to realize his dream of mounting animals in characteristic attitudes in the proper setting of plant life and landscape aided by painted back-

Photograph by Julius Kirschner

MR. AND MRS. CARL E. AKELEY

MRS. AKELEY HAS REMAINED IN AFRICA TO COMPLETE THE WORK BEGUN BY HER HUSBAND.

grounds, Akeley began to look to other fields. William Morton Wheeler, one of his associates at Ward's, had left and was teaching in the high school in Milwaukee. In order to help Akeley continue his academic education, Wheeler offered to tutor him if he would come to Milwaukee. Akeley accepted this kind offer and got a job at the Milwaukee Museum to pay for food and lodging while he prepared for college. He says he almost deserted taxidermy to become a professor, but the work at the museum so engrossed his attention that he definitely decided to make it his life work. He stayed eight years in Milwaukee working at his chosen vocation in the museum and in a shop of his own.

One of the directors of the Milwaukee Museum had been to Lapland and had brought back the skin of a reindeer and a Lapp sledge and harness, which he was anxious to have shown in the museum. Akeley turned this material into a group of a Lapp driving his reindeer over the snow, the first habitat group he ever built. Later he mounted a group of orang-utans in lifelike poses, using some bare branches as accessories.

The reindeer and orang-utan work encouraged Akeley to suggest a series of the fur-bearing animals of Wisconsin. The first of these to be built was the muskrat group, which still stands, after more than thirty-five years, as good as new.

From Milwaukee Akeley went to the Field Museum of Natural History in Chicago, and it was under the auspices of the latter institution, in company with Professor Daniel Giraud Eliot, curator of zoology, that he made his first expedition to Africa, starting in 1896. In this part of the world where the age of mammals is better represented in species and in individuals, especially the larger kinds, Akeley was not discouraged. On the contrary he was stimulated to attempt to bring Africa to America, not the animals alone, but the animals in their natural surroundings, a hereulean task that only tremendous enthusiasm would undertake.

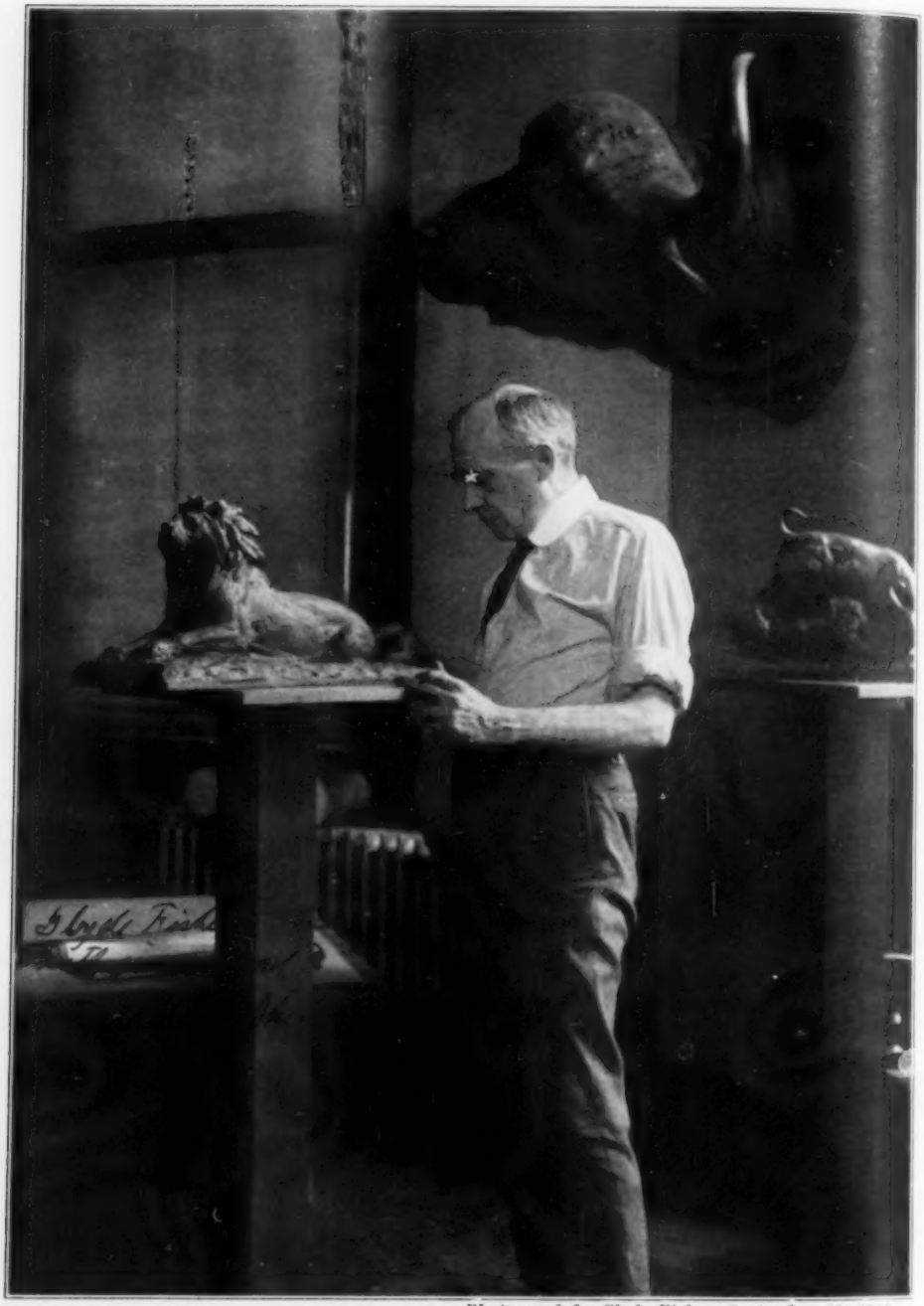
After returning from Somaliland with Dr. Eliot he worked steadily for nine years as chief of the department of taxidermy of the Field Museum, mounting the animals they had collected and at the same time perfecting his new method of taxidermy.

To do taxidermy by the Akeley method, in the ideal way—and nothing short of the ideal ever satisfied Akeley—one must know the animals in their native haunts, must be able to collect his own specimens, must know animal anatomy, and must be a sculptor, for the animal must be modeled in clay. Then he must have enough artistic sense to make his groups pleasing as well as accurate.

One of the essential features of the Akeley method of taxidermy is the manikin upon which the skin is mounted. This must be light, strong and durable. Akeley described it briefly as follows:

> The first step is the construction of a rough armature, usually of wood and wire, upon which I make a life-size clay model of the animal to be mounted. The modeling is done almost as carefully as if it were to be cast in bronze. At this stage I check the accuracy of the model by measurements made in the field, by photographs, and by "trying on" the tanned skin itself. The second step is to take a plaster mold of the clay model which can be handled in sections. Each section of the mold is then lined with glue, over which is laid a sheet of muslin. On top of the muslin are placed several layers of wire cloth and papier-mâché, each layer worked carefully into every crevice of the mold. A coat of shellac makes each layer impervious to moisture and the reinforced papier-mâché is light and durable. When the last coat of shellac is thoroughly dry, the whole thing is immersed in water, the glue melts and the sections of the manikin come out of the mold, ready to be assembled in a clean and perfect replica of the original clay model. Finally the skin is drawn over the manikin, to which it is carefully cemented, the eyes are set and other "finishing" details given attention. Then the animal is ready to take its place among the fellows that comprise the group in a scenic setting of painted background and reproduced foreground.[1]

[1] *Mentor*, January, 1926.



Photograph by Clyde Fisher, September 12, 1919

CARL AKELEY IN HIS STUDIO

MODELING THE ROOSEVELT LION ON SMALL SCALE IN PREPARATION FOR THE HEROIC SCULPTURE, CONCEIVED AS A MEMORIAL FOR HIS GREAT FRIEND AND FELLOW HUNTER-NATURALIST. AKELEY FELT THAT THE LION IN ALERT REPOSE, BETTER THAN ANYTHING ELSE, SYMBOLIZED ROOSEVELT.

HABITAT GROUP OF LIONS

DAWN—THE MORNING SUN HAS STRUCK THE PEAK OF MT. KENYA BEFORE FLOODING THE PLAINS BELOW WITH THE LIGHT OF DAY.

The above description would apply to the mounting of a deer or a buffalo, but certain modifications are necessary in mounting a rhinoceros or an elephant. It should also be stated that no group is prepared without first working out all the attitudes or poses of the animals, and the general composition of the group, in a small sketch-model carefully made.

Besides the groups of African animals which Akeley prepared there is a series of noteworthy groups of American animals which has attracted attention and commanded admiration of thousands of visitors. These are the seasonal deer groups, made in Akeley's own shop and subsequently placed in the Field Museum. There are four groups in which the Virginia deer is represented in each season of the year. Here is shown the story of the shedding of antlers and the growing of new ones, the changing of the short-haired reddish coat of summer to the longer-haired gray coat of winter, the story of the young and their growth, as well as the entire cycle of the seasons in the plant life of the accessories. It took Akeley four years to complete these groups, for he had to devise, as he went along, his methods of manikin construction and of making such accessories as artificial snow, moss and leaves. These

Copyrighted. From IN BRIGHTEST AFRICA, *by Carl E. Akeley. Courtesy of Doubleday, Page & Co.*

THE GORILLA CAMP, LOOKING TOWARD MT. MIKENO

HERE THE AKELEY EXPEDITION CAMPED IN 1922 WHEN IN PURSUIT OF GORILLAS FOR THE AMERICAN MUSEUM. FOUR YEARS LATER THE SLOPES OF MT. MIKENO HAVE BECOME AKELEY'S LAST RESTING PLACE.

four years mark the period of greatest development in the Akeley method, and hence in the art of taxidermy.

Akeley's second expedition to Africa was in 1905, when he collected the elephants for "The Fighting Bulls," now the dominant and impressive group in the Stanley Field Hall of the Field Museum of Natural History.

In 1909 Akeley made his third expedition to Africa, and this time for the American Museum of Natural History. Among other things he collected the animals for the statuesque group of African elephants for the proposed African Hall of the American Museum. After returning home from this trip, he mounted these elephants and they have been temporarily installed in what was formerly Akeley's "elephant studio." They now stand where they were mounted, awaiting the consummation of Akeley's dream, the construction of African Hall which Akeley proposed to build as a monument to his great friend, our naturalist president, Theodore Roosevelt. In fact the cow elephant of the group was collected by Roosevelt and the calf by Kermit Roosevelt, when they were hunting with Akeley.

It was on this expedition to the slopes of Mount Kenya and to Uganda that Akeley formulated in detail his dream of African Hall. On the main floor, the dominant group will be the great elephant group which Akeley usually called "The Alarm." There will also be a family group of black rhino and a similar group of the rare square-lipped or white rhino, and flanking these, the three large bronzes of the Nandi lion-spearmen. These will endure indefinitely without the protection of glass cases. All have been finished and are ready to be installed in African Hall as soon as it has been built. Except for the bronze figures "there will be nothing in the central hall to detract from the majesty of the elephants and the lumbering bulk of these rhinos."

Around this central hall there will be forty wonderful modern habitat groups of animals, twenty of which will be viewed from the main floor and twenty from the balcony. The four at the corners will be much larger than the rest and each will comprise several species of animals. In all these groups the animals will be shown in their natural surroundings, with backgrounds painted by trained artists from sketches made in the field. An indoor field-trip through this hall when completed will be the next thing to touring completely the African wilds. As the great game animals are now decreasing, the blue-buck, the quagga and others having become completely extinct, it will soon be impossible to see as much in Africa even by the most thoroughgoing search. The historic value of African Hall will increase as the years pass.

Just above each of the twenty habitat groups on the main floor is to be placed a bas-relief in bronze representing the relation between an African tribe and the animal life with which it comes in contact. For example, one panel will show a Dorobo family and their hut and their hunting dogs. The man is skinning an antelope. The members of this tribe depend entirely upon the beasts they kill for food and clothing. This frieze of bas-reliefs in bronze and such sculptures as the Nandi lion-spearmen bring out the relation between human life and animal life.

The habitat group of lions has already been finished and is ready to be moved over into African Hall when that is ready. Several other animals have been mounted and are ready to be installed with the proper accessories—for example, the gorillas.

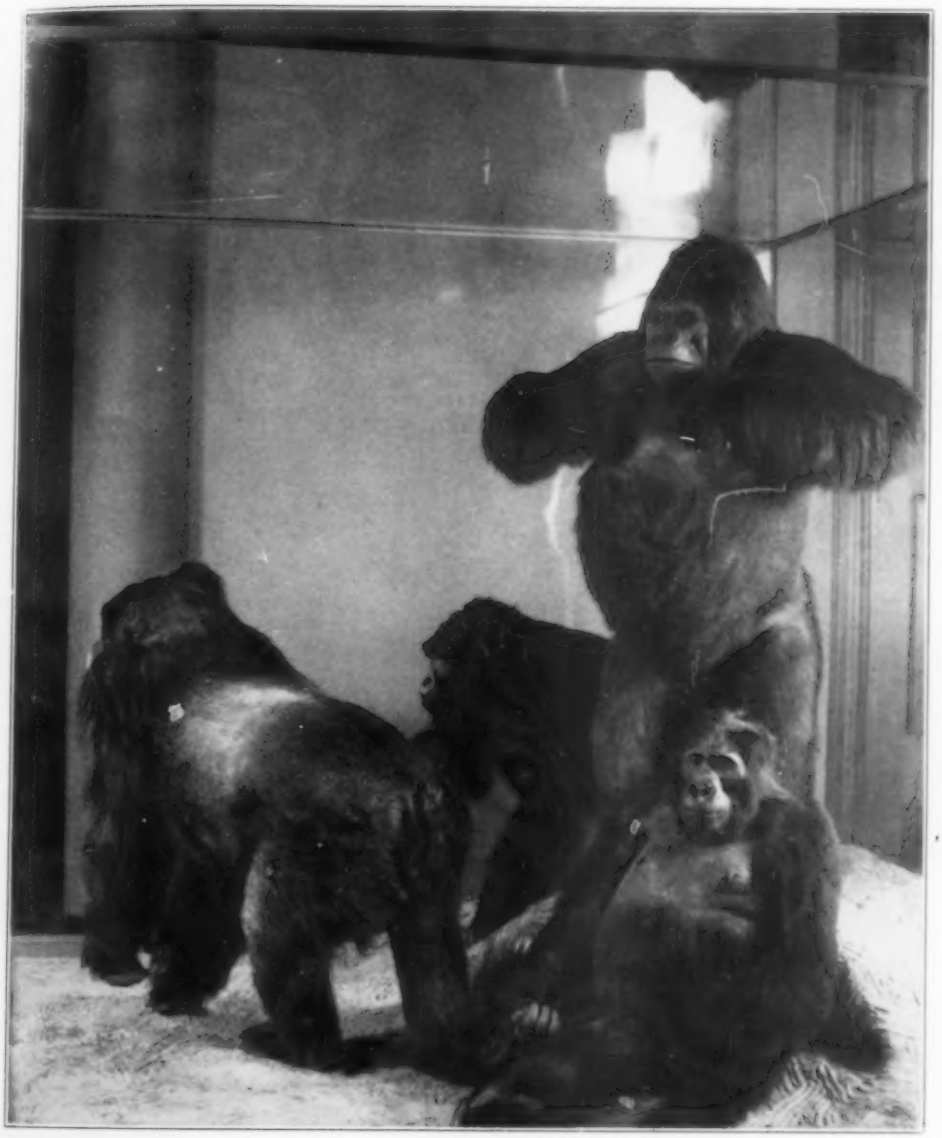
By a one-sided skirmish with an old bull elephant, Akeley was compelled to postpone his study of the gorillas which he had planned as a part of his third expedition. In this encounter Akeley was left crushed and unconscious, and

HERE THE AKELEY EXPEDITION CAMPED IN 1922 WHEN IN PURSUIT OF GORILLAS FOR THE AMERICAN MUSEUM. FOUR YEARS LATER THE SLOPES OF MT. MIKENO HAVE BECOME AKELEY'S LAST RESTING PLACE.

Copyrighted by Carl E. Akeley

GORILLA COUNTRY FROM MT. KARISIMBI. MT. MIKENO IN BACKGROUND

THE OLD STAG GORILLA OF KALISOKE HERD. SEE PAGE 107 FOR DESCRIPTION OF THE PASSAGE REPRODUCED ON PAGE 109



GROUP OF GORILLAS COLLECTED AND MOUNTED BY CARL AKELEY

THE SPECIMENS ARE TEMPORARILY PLACED, LATER THEY ARE TO BE INSTALLED IN THEIR NATURAL SURROUNDINGS WITH PANORAMIC BACKGROUND. IT IS PROBABLE THAT AKELEY'S LAST WORK WAS COLLECTING THE ACCESSORIES FOR THIS HABITAT GROUP. THE CABLEGRAM STATES THAT DEATH CAME ON THE SLOPE OF MT. MIKENO, AND IT WAS THERE FOUR YEARS AGO THAT HE SHOT HIS BIGGEST GORILLA.

Photograph copyrighted by Carl E. Akeley

A HERD OF IMPALA AT THE WATER'S EDGE

OF THE MANY SPECIES OF ANTELOPE IN AFRICA, THE IMPALA IS AMONG THE MOST BEAUTIFUL AND GRACEFUL. THIS PHOTOGRAPH SUGGESTED TO AKELEY AN EFFECTIVE TREATMENT OF THE FAR BANK OF THE RIVER WHICH WILL BE REPRESENTED IN THE WATER GROUP FOR AFRICAN HALL.

several months were required for his recovery. It was not until his fourth expedition to Africa in 1921–1922, that he entered the Kivu country, the home of the gorilla. At this time he made the first motion pictures ever taken of wild gorillas in their natural surroundings. By his studies he showed that this man-like ape is hardly wild, that it is not at all the ferocious beast that it was formerly reputed to be. The gorillas already prepared for the African Hall are the only ones ever mounted by a man who has seen them free in their native haunts.

On his fifth and last expedition to Africa, on which he embarked January 30, 1926, he was joined by Mr. George Eastman and Mr. Daniel E. Pomeroy, whose generosity had made the trip possible. It was planned to collect the material for five of the large groups of African Hall. Akeley was probably collecting accessories for the gorilla group as the last bit of work he did in Africa, for he passed away, according to the cablegram, on the slopes of Mount Mikeno in the heart of the gorilla country. His intrepid and courageous wife, Mary Jobe Akeley, herself an alpinist of international reputation, has remained in Africa to supervise the completion of his work.

The foregoing brief account outlines Akeley's accomplishment as an explorer, as a hunter-naturalist and as a taxidermist. As has been indicated, to be a taxidermist by the Akeley method, one must be a sculptor, and Akeley has told in small bronzes several dramatic stories of African life, besides the three large bronzes illustrating the Nandi lion-spearmen. These smaller bronzes will supplement the habitat groups of African Hall. Of these bronzes my favorite and the favorite of many of his friends is "The Wounded Comrade." In this a bull elephant, having been wounded by a hunter's gun, is being helped from the field of danger by two strong comrades.

Akeley was an unusual combination of the practical person and the artist with imagination, and these two phases of his nature always functioned together. However, several times in his life his inventive genius has sprung to the fore and he has produced some noteworthy machine. It is possible that we overemphasize the practical side of the inventor. Is it not probable that an inventor is always an artist?

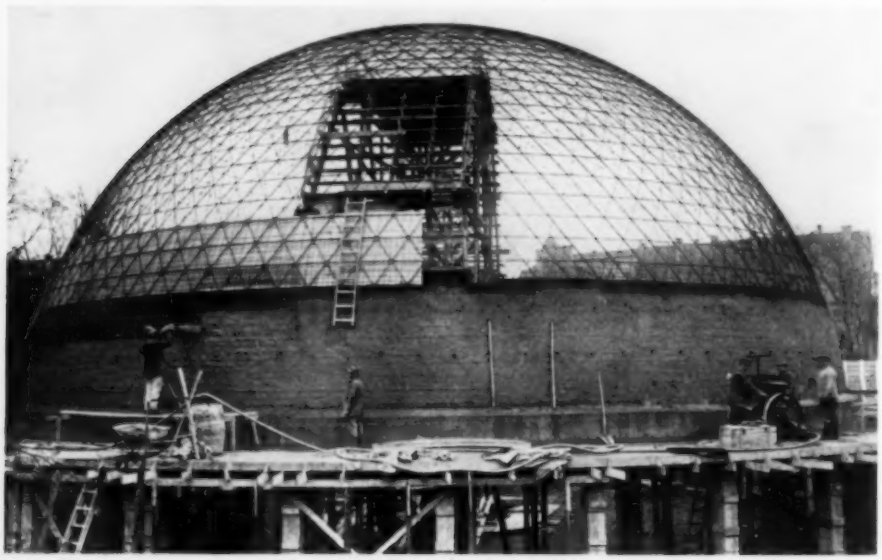
While he was a member of the staff of the Field Museum, that institution was housed in one of the buildings of the Columbian Exposition. During this time there developed a need for repairs to the stucco, and Akeley invented the cement gun to do the work. This is a modification of a compressed air spray which he devised for manikin making. By means of the cement gun, liquid cement is sprayed on in concrete construction. In this way a better quality of concrete is secured than in any other way, to say nothing of the convenience in certain cases. The Akeley cement gun was used in the construction of the Panama Canal, in lining trenches on both sides in the Great War, and for numerous other purposes throughout the world. In recognition of this invention, Akeley received the Scott Gold Medal of the Franklin Institute.

The Akeley camera came as a result of the inventor's disappointment upon finding that the conventional motion picture camera was too slow to be used in the field, especially in photographing such episodes as lion-spearing, which will not wait. From the tripod up, Akeley produced a camera far better adapted to the needs of the field naturalist than any in existence. His inventive genius may be appreciated when we realize that the Akeley camera is a distinct improvement on all other standard cameras in more than a dozen ways. It will suffice to mention two or three. It can be set up for action more quickly than any other. This was one of the main objects

AKELEY AN EFFECTIVE TREATMENT OF THE FAR BANK OF THE RIVER WHICH WILL BE REPRESENTED IN THE WATER GROUP FOR AFRICAN HALL.

AKELEY CEMENT GUN AT PANAMA CANAL

IN USE FOR THE PURPOSE OF PREVENTING SLIDES IN CULEBRA CUT.



THE AKELEY CEMENT GUN

IN USE APPLYING CONCRETE TO STEEL FRAMEWORK OF DOME FOR ZEISS PROJECTION PLANETARIUM IN JENA.

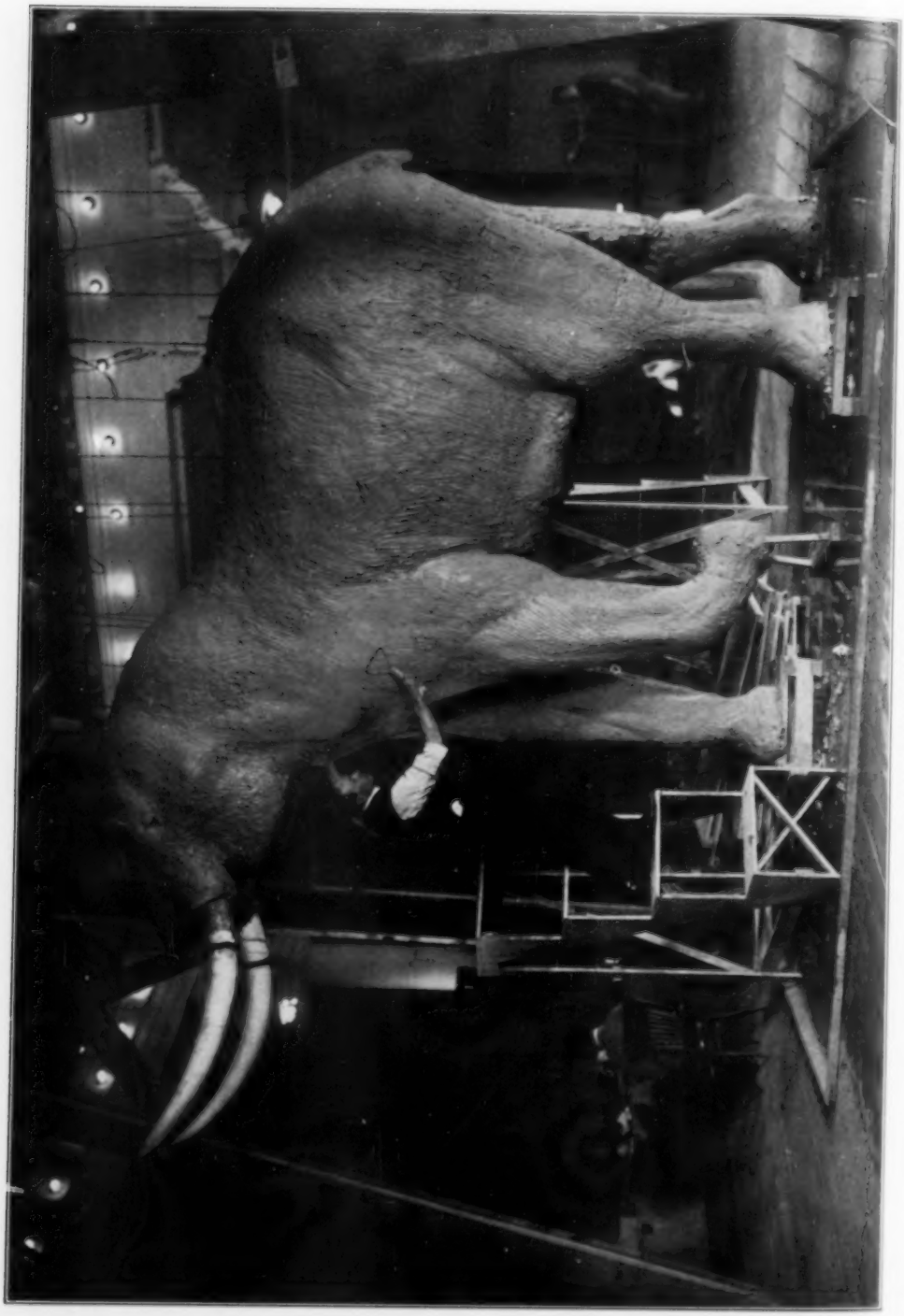
AKELEY CAMERA IN ARCTIC LAPLAND

IN 1924 THE WRITER USED THIS CAMERA IN MAKING A PHOTOGRAPHIC RECORD OF THE SUMMERTIME ACTIVITIES OF THE LAPPS. THIS IS REMINISCENT OF THE FIRST HABITAT GROUP AKELEY EVER MADE, THAT OF THE LAPLANDER DRIVING HIS REINDEER OVER THE SNOW, A GROUP PREPARED ABOUT THIRTY-FIVE YEARS AGO FOR THE MILWAUKEE MUSEUM. THE AKELEY CAMERA HAS BEEN USED IN MAKING MANY OUTSTANDING OUTDOOR PICTURES—AMONG THOSE ARE "NANOOK OF THE NORTH" AND "MOANA," BY ROBERT L. FLAHERTY; "THE TRUE NORTH," BY CAPTAIN JACK ROBERTSON; THOSE OF WILLIAM BEEBE'S EXPEDITIONS; THE BIRD PICTURES BY BENGT BERG, THE SWEDISH PHOTO-NATURALIST; AND THE AFRICAN PICTURES BY MARTIN JOHNSON.

determined upon by the inventor, after his disappointment in trying to photograph lion-spearing in Africa with standard type of camera. It has the most efficient shutter, thereby enabling one to make photographs under more adverse light conditions. In the evening toward the close of the football game, the Akeley camera operators make good pictures after the other camera men have gone home. Most valuable to the naturalist photographer is the panoraming device, making it possible to "pan" upward, downward or diagonally, thus keeping the bird or animal in the field no matter how erratic its movements. On this account the Akeley camera was the only one to get a complete picture of the last race run by Man-o'War. The Akeley camera is not a studio camera. It was not planned for that purpose. It is an outdoor camera with outstanding advantages.

When the World War came on, Akeley was past the age to enlist, but he gave his entire time to the government in mechanical research and investigation, especially in his contribution to concrete construction and in his improvement of large searchlights.

Thirty years ago Akeley went to Africa the first time, and in his subsequent trips he came to foresee the fate of the magnificent game animals of that



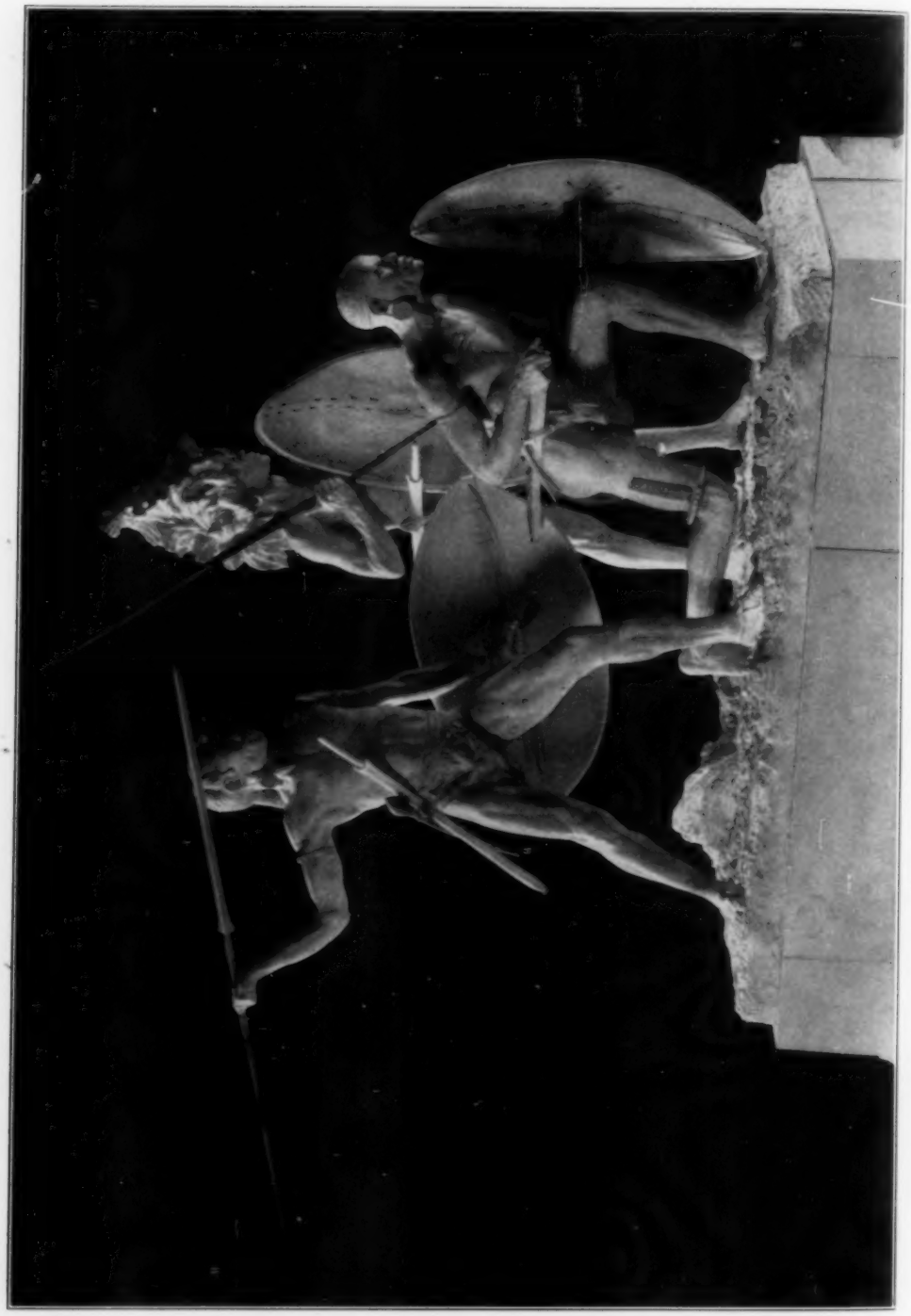
SCULPTURE IN TANIDERMY

ADDIE MORRIS, THE LADY WHO PUT THE "AMERICAN" IN THE AMERICAN MUSEUM OF NATURAL HISTORY. THE TAXIDERMIC MOUNT OF A HIPPOPOTAMUS

"STUNG"

SMALL BRONZE BY AKELEY REPRESENTING A YOUNG ELEPHANT TRAMPLING A POISONOUS SNAKE TO DEATH IN RETALIATION FOR A BITE ON THE TRUNK.

AKELEY MODELING THE LARGE BULL FOR THE AMERICAN MUSEUM GROUP OF AFRICAN ELEPHANTS. THE TAXIDERMIST MUST BE A SCULPTOR.
SCULPTURE IN TANIDERMY



"THE NANDI SPEARMEN," BY CARL AKELEY

ONE SPEARMAN HAS THROWN AND MISSED AND NOW DRAWS HIS SWORD TO MEET THE ONCOMING LION IN MID AIR IF NEED BE. THE SECOND IS ABOUT TO THROW HIS SPEAR. THE THIRD SPEARMAN, WHO WEARS A LION SKIN HEADDRESS, INDICATING THAT HE HAS GO A PREVIOUS OCCASION

"THE NANDI SPEARMEN," BY CARL AKELEY
ONE SPEARMAN HAS THROWN AND MISSED AND NOW DRAWS HIS SWORD TO MEET THE ONCOMING LION IS MID AIR IF NEED BE. THE SECOND IS ABOUT TO THROW HIS SPEAR. THE THIRD SPEARMAN, WHO WEARS A LION'S MANE HEADDRESS, INDICATING THAT HE HAS HAD A PERSONAL ENCOUNTER WITH A LION, IS READY TO THROW HIS SPEAR IF NECESSARY

"THE REQUIEM AFTER THE LION HUNT," BY CARL AKELEY

This group of statuary, together with "The Nandi Spearmen" and "The Charge," which is temporarily placed in what was once the Akeley "Elephant Studio," will be installed near the entrance of the African Hall. This one shows three native African (Nandi) hunters chanting a requiem over the body of a lion.

MODEL OF AKELEY AFRICAN HALL

ON THE MAIN FLOOR THE DOMINANT GROUP WILL BE THE GREAT ELEPHANT GROUP, WHICH AKELEY USUALLY CALLED "THE ALARM." AT ONE END WILL BE LOCATED THE BLACK RHINO FAMILY AND AT THE OTHER END THE SQUARE-LIPPED OR WHITE RHINO GROUP, AND FLANKING THESE WILL BE THE THREE LARGE BRONZES OF THE NANDI LION-SPEARMEN. AROUND THE PERIPHERY OF THE HALL WILL BE FORTY HABITAT GROUPS OF AFRICAN ANIMALS, TWENTY OF WHICH WILL BE VIEWED FROM THE MAIN FLOOR AND TWENTY FROM THE BALCONY.

"THE WOUNDED COMRADE"

AKELEY'S FIRST BRONZE TELLS THE APPEALING STORY OF A WOUNDED BULL ELEPHANT BEING HELPED AWAY FROM THE FIELD OF DANGER BY TWO COMRADES.

continent. He realized that they were doomed to decrease and even to disappear if something drastic were not done to prevent. Akeley always was a conservationist at heart, collecting specimens only to preserve them, but he did his first great work along this line when he secured the establishment of the first National Park in Central Africa, the Parc National Albert, in the Belgian Congo. This was set apart by a royal decree of His Majesty, the King of Belgium, on March 12, 1925. It provides absolute sanctuary for all the wild life within its confines; however, the animal which interested Akeley most in his efforts to accomplish this work of conservation was the gorilla.

Akeley gives much credit to His Excellency, Baron de Cartier de Marchienne, the Belgian Ambassador to the United States, and to James Gustavus Whiteley, the Belgian consul at Baltimore, for making this park possible. We believe with John H. Finley that Akeley's memorial lives in this great Kivu sanctuary.

Now Akeley's body lies in this beautiful spot. Surrounded by the romantic charm and the great natural beauty that he loved, no more appropriate final resting place could be imagined. Moreover, it was of his own choosing. Four years

ANIMALS, TWENTY OF WHICH WILL BE VIEWED FROM THE MAIN FLOOR AND TWENTY FROM THE BALCONY.

ago he said to the Bradleys, who accompanied him on that expedition, in speaking of his biggest gorilla, "I envy that chap his funeral pyre." Gazing at the fallen giant at his feet, he said, "I wish I could be buried here when I die."

In even a superficial review of Akeley's achievements, one is impressed with the unusual ability of the man. He stands out as an explorer, a sculptor, a taxidermist, an inventor, a conservationist, but more than all these, to those who knew him best, he stands out as a man, a very human man, with the characteristics that we all like, namely, straightforwardness, honesty, simplicity and genuineness. Akeley was a real man with a wonderful mind and a big heart. He loved children and he himself always succeeded in keeping a boy's heart below a man's head. One is reminded here of a quotation from Edward Simmons that Akeley liked: "'Whom the gods love die young' does not mean that they die when they are young, but that they are young when they die." This embodies something of Akeley's spirit that we like to remember.

Although Akeley could not live to see his dream of African Hall come true, fortunately he had trained, and trained well, other men who will be able to do the work in accordance with his ideals, and these men will be inspired to a great work as a memorial to their master. African Hall will be a monument to natural history, a thing of great beauty, as well as accuracy—as the realization of Akeley's fondest dream should be.

"THE CHARGE," BY CARL AKELEY

THE FIRST SPEAR HAS MISSED, AND THE LIONESS LEADS THE CHARGE WHILE HER MATE CROUCHES TO SPRING.

LAW ENFORCEMENT[1]

SHOULD THE TAX LAWS BE ENFORCED AND ENFORCEABLE?

By Professor FRED R. FAIRCHILD

YALE UNIVERSITY, RETIRING VICE-PRESIDENT AND CHAIRMAN OF THE SECTION OF SOCIAL AND ECONOMIC SCIENCES, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

TAXATION is the instrument by whose means we are induced to contribute the fund whose expenditure enables our government to perform those services which we, through our legislative representatives, have required of it. The philosophy of taxation presumes that the legislative body shall determine, first, the amount of money to be raised by taxation and, second, the machinery by which each shall be called upon to contribute his share in harmony with some general principle of equitable distribution. Taxation is thus a matter of legal enactment and administration. I invite your present consideration of what may at first blush appear to be the merely rhetorical questions: should the tax laws be enforced and enforceable?

In the old days of the absolute monarchy, the laws were not made by the people. They were imposed upon the people by the will of the king. A prevailing spirit of hostility and opposition to law was the normal condition; it was taken for granted that people generally would violate the laws if they could with impunity. Enforcement of law was accomplished only by the power of might against the will of the people. But in the theory of the modern democratic government, the laws are enacted by the people, imposed upon themselves by themselves for the common good. In the normal case it is to be assumed that the great majority are in sympathy with the laws. The officers charged with enforcement are entitled to the presumption that the people want the laws enforced and will offer, not resistance, but encouragement and cooperation. The whole problem of law enforcement takes on a different aspect from that which it wore under the absolute monarchy. To-day a law which does not have the approval and support of the great majority of the people is difficult or impossible of enforcement, simply because the old idea of enforcement by main strength against a hostile people has been abandoned and the government has come to rely upon the good will and cooperation of those to whom the law applies.

What is stated thus in general terms applies most pertinently in the field of taxation. The long and painful process by which the people exacted from their rulers the right to determine the taxes which they should pay is familiar to us all. It is to-day an axiom of government that taxes may be imposed upon the people only by the act of their own legally qualified representatives. In very truth, the people tax themselves. They determine the amount that shall be exacted by taxation and the particular tax methods by which this amount shall be obtained. The public officials charged with the duty of assessing and collecting the taxes are entitled to the assurance that what they have to do has been approved by the people themselves, and

[1] Papers presented in a symposium before Section K—Social and Economic Sciences—of the American Association for the Advancement of Science, Philadelphia, December 28, 1926.

they are entitled to presume upon the good will and cooperation of the public in carrying out this mandate.

But let no one harbor the delusion that popular cooperation may take the place of official enforcement. The tax law will not enforce itself. The taxpayers can not be called upon to shoulder the burden of enforcement. Cooperation may be counted on. Actual assistance in the administration of the tax law may be asked and obtained. The taxpayer is called upon to furnish lists of his taxable property and to render accounts of his taxable income. Information of great variety and in great detail is required. To a very considerable extent the taxpayer is asked to assess the tax against himself. But such aid is rendered only on the assumption by the taxpayer that he is doing merely what the law requires of all. He admits the necessity of taxation. He assumes that the tax system has been devised by the legislature with the intention to distribute the burden of taxation according to some reasonable principle of justice. He is willing to pay his share and even ready to aid the assessor in determining exactly what is his share under the law. All this, however, on the assumption that the taxing authorities are playing fair with him, that what they ask of him they also ask —and require—of others; in short, that the tax law is enforced.

It follows that voluntary cooperation of the taxpayer can never be turned into self-enforcement of the tax law. Failure by the duly constituted officials to enforce the law can not be long concealed. And just as soon as failure is generally known comes the end of the assumption upon which the taxpayer cooperates in enforcing the law against himself. During the American Revolution, the Continental Congress had no authority to tax the people. Instead it drew up its financial plans and apportioned the cost among the several states, asking each to contribute its fair share. The states were all involved in the war for independence and had of course every reason to give financial support to the common cause. Yet there arose at once in each state the suspicion that other states were not doing their part, and each state undertook to make its own contribution small enough so that it would run no risk of paying more in proportion than its neighbors. So the system of requisitions upon the states broke down. Efficient and even-handed enforcement is the price any government must pay for the good will and cooperation of the citizens in the administration of its laws.

It is here that our tax system has failed. Every American is subject to the general property tax of his state. There are forty-eight states and forty-eight separate tax laws, but their fundamental features are still much alike. It is required that each person's name be entered in a list and that opposite his name be a description and valuation of all his taxable property. Assessors are provided by law, charged with the duty of preparing these tax lists. The category of taxable property includes, in most states, not only real estate, but such forms of tangible personal property as household furniture, books and libraries, musical instruments, jewelry and intangible property such as notes, bonds, credits and book accounts, money on hand, deposits in banks and sometimes shares of corporation stock. To aid the assessor in the obviously difficult task of discovering and valuing all these classes of property in the possession of each owner, the law calls upon the taxpayer for cooperation, to the extent generally of rendering at least a list and description of all his taxable property. But the law never contemplates self-assessment. The official tax list is the work of the assessor. Nothing that is required of the taxpayer relieves the assessor of the duty to discover and value all taxable property of every owner.

And how do the taxing officials carry out this legal mandate? With respect to real estate the assessors do generally make a serious attempt to examine and value all taxable property, at least once in three or four or more years. As regards personal property, the practice varies. Obviously the duty imposed by law upon the assessors would require an actual visit to the home of each taxpayer and a careful inspection of all his personal belongings, in order to discover and value his taxable tangible personalty. Even more elaborate and complicated procedure would be required to assess intangible property. In a few states such measures are taken, more or less perfunctorily. But such inspections are the exception, not the rule. In general the assessor accepts the taxpayer's statement with little or no question, scrutiny or check. The taxpayer who omits important items from his list incurs little risk of detection or punishment. Even the absence of all items of personal property neither arouses suspicion nor leads to investigation by the assessor. In many a town it is taken for granted that few persons of ordinary means will list anything in the way of personal property. Declaration of items of household furniture, books, jewelry, etc., is apt to cause surprise on the part of the assessor. In many towns it is obvious that such declarations are unwelcome; they break into the regular routine of the assessor's office; they are not encouraged. May I read, as an extreme instance of this, a passage from the report of the tax commissioner of Connecticut of an official investigation of the taxation of property in Bridgeport, Connecticut:

> The testimony relating to the bringing in of lists by taxpayers shows that the assessors, three in number, with from four to six clerks and assistants, work from nine o'clock A. M. until four o'clock P. M. daily during September annually receiving lists from and filling out lists for taxpayers. Few of the number so employed in 1923 are shown to have had experience or training of a character to fit them to perform such duties. The average working time per day for each person thus employed was less than six hours. In the fore part of the month four or five hundred were received daily, but later in the month nine hundred to one thousand lists were daily filed with or filled out by the assessors. The last day, September 30, 1923, lists were received between nine o'clock A. M. and noon. On that day and in a period of three hours, with a force of nine people employed, between seven hundred and eight hundred lists were filled out for the taxpayers, and approximately two hundred and fifty additional lists were received other than those so filled out. The last mentioned number were handed in by real estate men and others who may be presumed to be familiar with making out such lists. At certain times, if not all of the time, there was a general condition of congestion in the city hall, and lines of taxpayers, each waiting for his turn, were formed. On the last day mentioned there was fighting, and the police were called to suppress disorder. The line of taxpayers was formed to pass the desks of the assessors and clerks who were filling out the lists. It is the practice for an assessor or clerk who fills out a list for a taxpayer to read the list of the taxpayer's property of the year preceding and inquire whether the taxpayer has transferred any property during the year. If it appears that such transfer has been made, the memorandum of the town clerk, which is required by law to be filed with the assessors prior to September 1, showing transfers of property in the year preceding, is examined, and notation on the list so being made out is entered. The separate parcels of real estate are not described on the list as the law requires. A card system is maintained showing location of each parcel of property to be taxed, but the information on such cards relating to land and buildings is meager. After having filled out a list for a taxpayer, no opportunity is given him to see it, except when it is placed before him for his signature. The taxpayer is not asked if he has any other taxable property specifically mentioned on the form on which he lists the property. The taxpayer is not asked if he owns household furniture, jewelry, pianos, bonds or notes, or other taxable property. By this procedure each person thus engaged fills out from sixty to one hundred lists for taxpayers in a period daily of less than six hours, and on occasions during the closing days of September this number is much exceeded.[2]

While this is the account of an extreme case, the essential situation thus exemplified is quite general. It is well

[2] Sup. Rep. Tax Com. 1923–24, p. 7–8.

known. Taxpayers have ceased to respect those parts of the law whose enforcement is left to their own voluntary action. If no attempt is made to obtain the listing of household furniture, each taxpayer reasons that if others pay no taxes on such property, why should he? I have frequently heard some exceptionally conscientious taxpayer remark ruefully: "According to the town tax records I am the only person in my block who owns any taxable furniture, musical instruments, or jewelry," or "according to the tax records I appear to be the richest man in my district, though everyone knows there are a dozen men who could buy me out without turning a hair." Only the extremely quixotic will long permit himself to remain in this position.

Not so long ago I had occasion to test the assessment of jewelry and watches in the city of New Haven by an inspection of the records of the probate court. In the inventories of seventy-one estates examined the total value of jewelry and watches was $123,042. The late owners of this property in their last tax lists had reported as the value of this property (in excess of the legal exemption of $25) just $3,900. Of the seventy-one owners, thirty-two had filed no tax list whatever; of the rest, twenty-eight had listed nothing under this head; eleven had listed something less than the true value; while three had made a correct return. Of these three paragons of civic virtue, two were women and one was an insane man. The following plaintive wail from a not too ancient report of the Kentucky Tax Commission paints a fair picture of the situation in many states.

> There are a few good assessors in the State—we say a "few" for the lack of a general term that expresses a lesser number.
>
> The impression seems to be gaining ground throughout the State that we have a "single tax" system, and that personal property is exempt from taxation, and, inasmuch as real estate is compelled to bear the burden, it is the privilege of the owner and the duty of the officials to connive to list all property at a very low figure. In the matter of personal property no witness testified that the assessor claimed to have assessed it fully, or that the owners had intended to give it in at its worth. In substance, they contend that it is not given in anywhere, and excuse themselves on the ground that it is a matter of perjury or poverty, and exercise their right of choice.
>
> The result is that after the number of lists that the assessor arbitrarily increases is added to the number that the County Board of Supervisors raise, there remains about 95 per cent. of the people in the State who fix the sum themselves upon which they are willing to pay taxes, and it is a safe assertion that 99 per cent. of that 95 per cent. are not inclined to pay a great amount.

In the absence of real enforcement of the law, other devices aimed to make the taxpayers toe the mark are futile. The taxpayer is required to take oath to his return. Result: "taxpayers oaths" becomes a bye-word. Heavy penalties are imposed for failure to list property. The penalties are as unenforced as the law itself. In short, that support and cooperation which might be counted on in behalf of a law well enforced is lost. The general property tax has become a notorious farce.

I have dwelt at some length upon the general property tax, the chief source of revenue of our states and their local subdivisions. The corresponding place in the revenue system of the federal government is occupied by the income tax. The situation here is distinctly better. Yet, after all, the difference is one of degree only. The high hopes with which we greeted this new taxing device some dozen years ago have been by now considerably dimmed. And the chief cause has been, I believe, the reliance upon self-assessment with inadequate checking. The returns of the largest taxpayers receive more or less careful examination, though generally so long after the time of filing as to lose much of their effectiveness. As to the returns of the more numerous class of small taxpayers, there is little beyond the checking necessary to determine whether the several items on

the return are in proper form and consistent among themselves. To a very considerable degree the taxpayers are left to determine, each for himself, what the amount of his tax should be, and there is increasing popular suspicion as to the accuracy and honesty of the returns. There is danger that the income tax may go the way of the property tax.

To place responsibility for this situation upon the taxpayers is idle. Harping on the deficiencies of "dishonest taxpayers" gets us nowhere. Is a man "dishonest" because he does not do, to his own hurt, what it is the business of the officers of his government to do? What should the honest taxpayer do? Take, for example, the case of bonds and similar investments. There is, let us assume, no serious attempt, or at any rate no successful attempt, by the assessors of his town to discover and assess such property. Owing to the escape of so much taxable property and the prevailing undervaluation of that which does not escape, the tax base is narrowed and, in order that the necessary revenue be raised, the tax rate must be correspondingly high. Rates of two per cent., three, four, five per cent. or even higher are common enough. Must the honest taxpayer list at its full value (he can scarcely enter it at any other value) a $1,000 four per cent. bond, when his local property tax rate is five per cent., and pay $50 a year in taxes on a bond from which he derives an income of $40 a year? Even if his town imposes the very moderate rate of two per cent., his tax would equal half the income from the property. Certainly this result is not in harmony with the spirit of the tax law.

Shall the honest taxpayer declare at its full value all his taxable household furniture, clothing, jewelry and other personal effects, when he knows that the great bulk of all such property of other owners is untaxed? Must he insist on the assessment of his real estate at its full value, when he knows that others put theirs in at half or a third or a quarter of its value? Is he a "perjurer" because he and all the other taxpayers in his state take oath each year to tax lists which in ninety-nine cases out of a hundred are false? Is he a crook because he does what every one else does, what the taxing officials permit or even encourage, and what he must do or be outrageously punished for his pains? As Edmund Burke said of the American colonists, you can not indict a whole people. You can not say the whole American public is dishonest, save only those few quixotic souls who, by obeying the letter of the tax law, do violence to its spirit.

No more can we lay the blame on the assessors and other taxing officials. Assessment of the property tax requires, first, the discovery of all taxable property and, second, the valuation of such property. No especial difficulty is involved in the discovery of real estate and the more bulky and visible forms of tangible personal property, such as machinery, farm animals, etc. Other forms of tangible personalty, such as household furniture, books, musical instruments, etc., present serious difficulties. Nothing short of a house-to-house search would suffice, and such procedure is most unwelcome to the taxpayer and naturally repugnant to the assessor. In the case of the more valuable forms, such as jewelry, the most thorough search would often fail to discover the taxable property. If regular house-to-house search were the rule, as it is not, much of the most valuable personal property could be readily concealed or spirited away over tax day. When we come to intangible personal property, concealment is so easy that anything like general discovery, except with the aid of the taxpayer himself, is quite out of the question.

If discovery of taxable property is a difficult matter, the process of valuation is infinitely more so. Our state tax laws pretty generally agree, I believe, upon

the meaning of value for tax purposes. They have in view the actual market value—what the property would sell for—and are thus in agreement with the concept of value as set up in the science of economics. Now, except at the very moment of sale, the determination of what a piece of property would sell for—that is, its value—is a matter of judgment or appraisal. Tax assessment is nothing other than the discovery and appraisal of taxable property.

Now appraisals, in business and practical affairs, are common enough, and every one must have some notion of the process and the conditions requisite to accurate appraisal. It will be recognized that appraisal is the work of experts and specialists, that the man capable of a trustworthy appraisal of rural real estate might cut a sorry figure if called upon to appraise the machinery and equipment of a watch factory or the inventory of a dry goods store. It will be recognized that real appraisal involves time and expense and will generally require the assistance of the owner of the property. This is what appraisal means to the business man, the banker, the insurance company, the investor. And I submit that nothing less will suffice for such assessment as will carry out the spirit of the general property tax and lead to a just apportionment of the tax burden.

But when we turn our attention to the actual facts of assessment, in the typical town, what do we find? An assessor or a board of appraisers, probably none of them expert appraisers, and even if so, necessarily expert in only a few lines, paid at a rate utterly inadequate to command expert knowledge or experience, with virtually no resources for employment of the necessary accounting, engineering and clerical assistance, and required by law to assess all the taxable property in the town in a period of a few weeks or months. The property which they must assess may include agricultural lands and buildings and city lots and residences, factories of every possible variety, with their machinery, equipment, raw materials, goods in process and finished products, stores with inventories of merchandise of infinite variety and complexity, corporation stocks, bonds, mortgages, book credits, patents, "good will," etc., household furniture, works of art, libraries, jewelry, musical instruments, and so on indefinitely.

Now there are cities which have splendidly organized boards of assessors, well paid, permanently employed, and with expert knowledge of values of real estate and possibly a few classes of personal property. But this represents the most favorable situation and applies only to the few exceptional cities. In the ordinary town, the assessing board is quite incompetent to perform anything approaching a real assessment of even a few of the classes of property under their jurisdiction, to say nothing of the whole list of taxable property.

Let me emphasize that this conclusion implies no disparagement of the great body of American assessors. They are generally men of ability and honesty, and they take their work seriously and do the best they can. The point is that the law imposes upon these men a task which is utterly impossible of accomplishment under the conditions. It is high time that the American public recognized this situation and prepared to face its necessary implications.

My time is limited, and I shall not try to develop at equal length the corresponding situations in the federal tax system. That the condition is similar will appear from the briefest glance at the operation of the income tax. The mere reading of the full text of this law would be enough to cause the ordinary citizen to entertain doubts of his own sanity. The officials charged with its administration have shown remarkable skill in constructing the forms and framing

the instructions for guidance of the taxpayer. Yet few taxpayers having incomes even moderately complex are able to make out their own returns without the aid of lawyers, tax experts and accountants. Students of the problem are becoming increasingly alarmed at the situation which has been created by the almost unbelievable complexities of the income tax law. I feel quite safe in asserting that the task of a real enforcement of the federal income tax in its present form—an enforcement which would command the respect of the taxpaying public and enable each taxpayer, when making out his own return, to assume with confidence that all other taxpayers were being required to render accurate returns—is beyond the powers of the present administrative staff or any other administrative machine which could possibly be set up.

And this again is said in no spirit of disparagement of the income tax personnel in the office of the commissioner of internal revenue. It is simply the statement of the inevitable conclusion that here again the law has placed upon the taxing officers a task impossible of accomplishment.

In thus laying before you my conclusion that the two principal taxes imposed respectively by our federal and our state and local governments are in their present form incapable of a real enforcement, I do not wish to be understood as implying that there is no such thing as an enforceable tax or even that all parts of our present tax system are unenforceable. Consider, for example, a method which has been devised by several of the states for the taxation of the public utility corporations. Having experienced the difficulties and uncertainties inherent in those methods of taxation which required an annual assessment either of the property or of the securities of these corporations, certain states determined to substitute a tax upon gross earnings. At once the whole situation was changed. The gross earnings of a public utility corporation are a simple matter of fact, shown without ambiguity in the books of the corporation (assuming, as is generally the case, that the books are kept in accordance with a prescribed system of accounts). No duty of self-assessment is imposed upon the taxpayer corporation, only the obligation to report from its accounts certain facts, including those required for any interstate apportionment which may be required. The taxing officials can readily check the accuracy of the report. Given the tax base, thus readily determined, the calculation of the tax is a simple problem of arithmetic; taxpayer and tax official will arrive at the same result. There may be features of the gross earnings tax which invite difference of opinion, but at any rate this tax furnishes an example of simplicity, certainty, smooth operation and real enforcement in startling contrast with the property tax and the income tax.

Thus I arrive at the answers to the questions which stand as the head of my essay. The tax laws should be enforced. Any other situation is intolerable. But the reason the tax laws are not enforced is that they are not enforceable. Let no one think that enforcement is to be obtained by giving greater powers or higher pay to the taxing officers, or by increasing the severity of the penalties for tax evasion or by starting a popular hue and cry against "dishonest taxpayers." In only one direction is the remedy to be sought. The tax laws must be made enforceable. How this is to be accomplished is another question, one which may well enlist the utmost skill of the tax students and experts and the patient constructive thought of the taxpaying public. But this question must be deferred to another occasion. It is not part of the title of my present essay.

THE IMPORTANCE OF RESEARCH IN ECONOMIC AND SOCIAL PROBLEMS

By Professor JOSEPH H. WILLITS

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A SECOND vice-presidential address may seem a little rough on the audience. One of the references to the program of this meeting, however, contains a saving clause which protects the audience. The statement refers quite properly to the words of Professor Fairchild and myself as "Introductory Remarks," implying that upon the conclusion of our remarks the real program will begin. This clause protects the audience and permits me to limit my remarks to those which are strictly introductory in character and which are directed at least as much to those who should support research as to this audience.

It may seem that a discussion of the importance of research in this general field may be somewhat foreign to the discussion in a program devoted to the subject of "Law Enforcement." But there is always a place in the discussion of any scientific problem for a reemphasis on the research base upon which the whole edifice must be built. For reasons which I shall elaborate this is particularly true in the fields of the economic and social sciences, where the factors in any problem are so numerous and so varied and where the practical judgments which must be made day by day in a democracy seem almost to place a premium upon superficial decision rather than complete study of all the elements. The very interest of society in the problems we are studying robs us of that leisure and opportunity for uninterrupted scholarly deliberation which encouraged if it was not directly responsible for much of the finest of the work of the older workers in the physical sciences. Refutation tends to follow more closely upon the quick publication of a little useful knowledge than it does upon the patient, obscure analysis and weighing of all the elements in any problem. Our energies tend to be pulled in the direction of speech-making and textbook writing rather than research.

We need to recognize a new "Malthusian" law in the field of economic and social problems. Whereas the "law" of Malthus posited that population tended to increase in a geometrical ratio and the means of subsistence only in an arithmetical ratio, this law would recognize that whereas our problems in the economic and social fields are increasing in a geometrical ratio, man's means of understanding and meeting them are increasing only in an arithmetical ratio.

It is a stressing of the obvious to dwell upon the rapidity with which our problems in the fields of the social sciences are increasing in number and in complexity. But the importance of the situation requires that we be willing to repeat things that should be familiar to all. We need and society needs to see our task in more fundamental terms than we have yet succeeded in doing.

Last March, David Houston, formerly secretary of the treasury and now president of the Bell Telephone Securities Corporation, gave a very remarkable address at Stanford University on the occasion of the opening of their new graduate school of business. It was an address filled with statistical material to illustrate the revolutionary change that had come over industrial and social America in the last fifty years. To repeat only a

few of the evidences of transformation in the scale of things and in the manner of doing things can not give an adequate impression of the completeness or fundamentalness of the revolution which has taken place within the lives of the older men in this room. But consider only a few of the more obvious of the changes that have taken place in the last fifty years and which constitute the inadequately appreciated revolution that has occurred in the size and nature of our business development and social life and problems in that period. If we take these few items merely as illustrations of that which is universally true we may perhaps imagine the speed with which the tasks to which scientists in this field address themselves have been growing:

Nine billion dollars a year on automobiles—enough to extinguish the national debt in less than two years;

Fifty million telephone conversations a day;

Seven hundred million dollars a year on movies—as much as was spent for the federal government's prewar expenses;

Four hundred millions on radio.

In the words of Secretary Houston:

In 1776 we declared our independence of a political power; it begins to look as if in 1876 we declared our independence of nature, or rather, as if we declared our determination to control nature and to make her serve in a higher and higher degree our purposes.

In 1876, when the oldest of us here were still young, exports were worth $600,000,000; they are now worth in rough figures $5,000,000,000. The number of our savings banks deposits then totalled 2,000,000; now they total 45,000,000 with deposits of $23,000,000,000. Then 900,000 insurance policies; now 90,000,000 with a total of $70,000,000,000, fifteen billions more than the prewar wealth of France. Then we spent $83,000,000 on education; now we spend more on education than all the rest of the world—or a total of $2,000,000,000.[2]

[2] In these figures allowance must be made for changes in the value of the dollar.

These are illustrations only of the changes in the scale of things. This fifty-year period which brought more changes in business and social life than did the thousand years preceding is quite as much a change in the method of working and in the way of life as it is in the scale of business activities.

This revolution truly is breeding problems, economic and social, at a geometrical ratio. It is a good guess that the next fifty years will show at least a similar increase.

This revolution, born of physics and chemistry and engineering, has created the need, in fact, the dire necessity, for research in the field of economic and social problems. So rapidly have we built a business and social structure, a social and economic life, that we can only partly understand its problems. Whereas in 1876, casual study was sufficient to meet most of our needs, a problem then simple now becomes a major problem.

Consider, for example, the simplicity of the problem of locating a manufacturing plant in 1876 and then contrast that with the problem of locating even a small branch plant to-day. It is a problem which will concern the management for months at a time and entail an endless chain of figures. The important thing is that our economic and social facts and problems are to-day far beyond the range of casual study.

Science and its applications have so rapidly drawn the world together that we not only don't know what to believe, but our whole economic and social structure is subject to a series of strains such as labor difficulties, ups and downs of the business cycle, unemployment and neurotic diseases. The point that I would emphasize is that if we are to live successfully in this new environment, if stability not only of individuals, but also of all industry, is to be maintained, we must not base our judgment of economic business and social problems on

casual opinion, but on a systematic collection and study of the facts.

We apply this method to-day pretty well to physics and chemistry and engineering, but we are only on the verge of applying it in the field of economic and social problems. We don't ask, "What are the facts and what do they prove?" but instead we are governed in politics, in business and in economics by hunch, by gullibility, by propaganda, by catchwords and slogans, instead of by facts.

We are passingly well equipped to meet and to study our problems in the older fields of physics and chemistry and engineering, but the most vital need of our time is for properly constituted research agencies that will, day after day, week in and week out, and year in and year out, bring together and study and analyze the facts concerning our business, economic and social problems. Only so can we deal with facts rather than with fancies. The same method that has proved to be good business in the field of the physical sciences is not only equally applicable, but it is more applicable to the fields of economic and social life because there sentiment, prejudice and confidence that "one knows it all" is particularly likely to obtain.

In other words, we are like a country that has at great expense and great effort built up a technique of shipbuilding and has turned out marvelous ships, but has given almost no attention to the study of the laws of navigation. Research in the fields of economics and business is designed to bring more facts to the attention of the society which has to guide that ship or that business. Most of our emphasis has been in the direction of research in the development of a technique of shipbuilding, which is important and essential, but it needs to be matched by the other form of research if our industrial society is to endure.

The great French chemist, Berthelot, liked to think that a fitting motto for his beloved science was "savoir c'est pouvoir"—"to know in order to do." To the successes of chemical science we owe many of our "creature comforts." Yet in spite of the unbelievable contributions of science to our physical world, it has done little to adapt us as individuals to the new conditions with which we are surrounded. Science has built us an industrial machine, without studying how we are to run it; science has built us an industrial house without teaching us how to live in it. Within the limits where industry determines or affects the destinies of "us humans" there is immediate need for thorough-going research into the factors that affect the relations of individuals to our industrial and social environment. Such study is necessary to use adequately the material blessings which our natural resources and our knowledge of physics and chemistry have showered on us; indeed, it seems essential if we are to control our new material creations for human welfare, and not its "illfare."

I would emphasize just one more fact, and that is that more and more there is evidence appearing, especially in the field of social and economic research, that we are past the day when we can expect any very important results in attacking such problems by lone workers. The day of the old professor who goes into his laboratory with a test tube and half a dozen text-books is passing, and the possibility of his bringing out any very important contribution will not be considered very great in the future.

Secretary Hoover has summarized this situation by saying, "The day is past when we can expect any very consequential discovery or invention by the genius working alone in the garret."

An organized department is required because the problems exceed the points of view, the resources and perhaps the life of single individuals. Consequently we are finding in business establishments, as well as in universities, the setting up of organized research departments.

The success of our endeavors in the field of economic and social research will answer the question whether the necessary economic and human adjustments may be made to an industrialized society, whether there exists a foundation for the gloomy pessimism that says, "Not only is there a Malthusian law of population; there is an even more portentous Malthusian law of economic and social problems."

Do I need to state the relation of all this to law-making and law enforcement? What should a sound law be but a legally enforceable generalization of conduct or procedure which finds a sanction in science and which does not proceed too far for the public opinion of the time? What are our difficulties of enforcement but one evidence that we have had too much faith in cracker box philosophy and too little in scientific study of problems? If we view them fundamentally, do the difficulties in law making and law enforcement mean anything more than the use of the Conestoga wagon and the practice of blood letting did a century ago—an inadequate scientific basis for attack upon our problems?

LAW ENFORCEMENT THROUGH SELF-RESTRAINT

By Dr. HASTINGS H. HART
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MUCH is said these days about law enforcement. The public press is filled with discussions of crime, law-breaking and contempt for law, prevalent not only among the open law breakers, the recognized enemies of society, but also among those who are ordinarily classed as law-abiding people.

Much is said also about crime waves. The press and the pulpit, the bar and the bench, unite in denunciation of the criminal classes and demand more rigorous treatment of the criminal and more faithful enforcement of the law. But what is a criminal, and what do we mean by law enforcement? A criminal is defined by the Standard dictionary as "A man who has committed an offense punishable by law"; and law enforcement, if it means anything, ought to mean holding violators of the law responsible for their acts and inflicting upon them the penalty provided by the statutes.

There is general condemnation for those who violate the laws against burglary, highway robbery, embezzlement, pocket picking, rape and murder; but a wide-spreading indifference to violators of the revenue laws, the Volstead Act and laws regulating gambling and traffic upon the highways.

It is difficult for the thoughtful student to recognize clearly the distinction which is wide-spread in the public mind between the acts committed by the "professional criminal" and those of the "law-abiding citizen." The professional criminal is artful in finding excuses for his unsocial course. He says: "I never had a chance; I was persecuted by the police; I was subjected to the tortures of the Third Degree; I got a raw deal from the district attorney; when I was a first offender I was forced into association with older criminals in jails who instructed me in crime and blackmailed me after I got out." One of the Younger Brothers, notorious bandits, who served twenty-five years in the Minnesota State Prison, said: "After the Civil War, when we were only boys, we were made outlaws and driven into the bush. They would not allow us to live as decent citizens." A prisoner in the Eastern Peni-

tentiary of Pennsylvania explained his presence there as follows: "You see it was about a horse. I took the horse with the understanding that if I liked him I was to buy him, but I didn't like him: so I sold him."

The reputable citizen who violates laws which are disagreeable to him makes similar excuses. The reckless speeder who inflicts wanton injury upon a foot passenger or upon the occupant of another car, says: "I had to make a train; I was late for dinner; my wife wanted to use the car; I love to ride fast." The woman of fashion who violates the customs law says: "I had to have those diamonds and I just couldn't afford to pay the duty; it was only a little piece of lace, it got overlaid in the tray of my trunk, and I forgot all about it." The violator of the gambling law says: "Everybody does it; what's the harm in a little bet on a horse race?" or, "It was only a five-cent ante, a game among gentlemen." The violator of the Volstead Act says: "These sumptuary laws are a violation of personal freedom. It is the duty of every good citizen to enter protest against them. Anyhow, that bootlegger held me up for three prices. I hope they will catch him and give him what he deserves."

We are in danger of laying too much stress upon the idea of *enforcement* and too little upon the idea of self-restraint. Force and fear are not the best governmental agencies for preserving good order in society—least of all in a democratic society; they should come last and not first. It should always be borne in mind that excessive severity tends to promote lawlessness, not to repress it. Harshness breeds resistance and undue severity may promote violence.

This principle was illustrated more than one hundred years ago when thieving was punished by hanging in England; but pickpockets were active among the crowds that were watching the execution of men or boys who had been convicted of stealing. It is being illustrated at the present time. Under the Baumes Act the judges of the New York courts are imposing sentences of thirty or forty years or life sentences for offenses which two years ago would have called for sentences of perhaps five, ten or at most twenty years. At the same time it is understood that the opportunity for parole before expiration of the sentence will be greatly restricted if not withdrawn.

Without debating the question of the ill desert of criminals who have been convicted of repeated offenses, it is already apparent that the imposition of these drastic sentences, together with the withdrawal of hope of earning a release on parole has a tendency to produce a feeling of reckless desperation which leads to the violent efforts to escape which we have recently witnessed in different parts of the country. Force and fear as measures for preserving order and protection of society have positive limitations, even in prisons.

The present prevalent idea that our prisons are being made pleasure resorts whose inmates are happier than their less fortunate neighbors outside is for the most part a plausible fiction. Isolated instances occur which may be open to the charge of pampering prisoners, such as the long-standing practice of allowing inmates of jails to carry considerable sums of money and to spend them for extra food and other luxuries, but these cases are exceptional.

The practice of providing outdoor recreation or indoor entertainments once a month or once a week is properly defended by experienced prison wardens who recognize that wholesome recreation is an essential part of normal human life and that it is much better to allow a prisoner to watch a ball game or listen to a concert once a week than to have him sit brooding in his cell night after night to cultivate a grouch and a spirit of bitterness against society.

The warden of the Sing Sing Prison has been severely criticized because moving pictures are exhibited in the prison several times a week at that institution. But the public does not understand that they are permitted not for the sake of furnishing amusement to the prisoner or because the warden considers their frequent use desirable but because he is compelled to keep a large part of his prisoners in horrible insanitary cells built a hundred years ago. These cells are three and a half feet wide, seven feet long and seven feet high. They are dark, ill-ventilated and unwholesome. They breed tuberculosis, rheumatism and pneumonia. Moving pictures are maintained in order to minimize the time which the prisoners must spend in these dreadful cells.

Rest assured that all prisoners suffer severely; the chief element of their suffering is the deprivation of their liberty and the necessity of absolute submission of their wills to the will of the prison warden. When the hope of liberty becomes remote the prisoner is likely to adopt desperate measures in order to obtain it.

Wise and experienced prison wardens learned long ago that the best prison discipline is that in which such a morale is established that the great majority of the prisoners are led to join cheerfully with the prison officers in maintaining order and in preserving the same spirit of industry, cooperation and good will which is essential to normal social life in the community at large.

It is unfortunately true that there is a certain portion of the community which can not be kept in order without the use of force and fear; and for this comparatively small contingent restrictive measures must be used, and while in progressive states like Great Britain and our own state of Massachusetts the proportion of such individuals has been greatly reduced, it is probable that we shall be compelled to maintain prisons and other restrictive agencies for generations yet to come.

We are recognizing, however, that the real purpose of criminal courts and prisons is not to get revenge upon those who have offended against the law but to protect society; and also that the protective power of forcible agencies, like prisons, is necessarily limited. Only a minor portion of the criminals of the community actually go to prison and their stay is comparatively brief. Sooner or later the great body of them return to the community and the real protection of society must come not from the severity of their treatment but from such a discipline as will tend to make them decent members of society, not because they are terrorized but because they have learned to be good citizens.

The Power of Self-Restraint

Many people believe strongly in the deterrent effect upon the community at large exercised by the practice of severity against the criminal. They believe that long sentences, increased hardships in prisons, the degradation and humiliation of convicted criminals all tend both to prevent a repetition of offenses and to prevent other people from becoming criminals.

Doubtless there is some truth in the doctrine of deterrence. The reckless speeder slows down when the traffic cop comes in sight, and the crowd of respectable citizens who throng the court room to listen to the trial of some notorious offender have a thrill of apprehension when the judge pronounces a sentence of solemn condemnation upon the convicted criminal. Ten thousand readers of the daily newspapers are reminded to some degree of the fact that the way of the transgressor is hard. But these lessons do not sink very deep nor do they greatly affect the minds of those reckless youths who are already taking lessons in criminal practice and who have become indurated by the idea that after all only a

fraction of the offenders against the law are brought to justice; and in the minds of thousands of them the idea prevails of taking a chance.

Respect for Law

Much emphasis is laid upon the small amount of crime reported in Great Britain and in Canada in comparison with that which is found in the United States. In visiting those countries one is impressed with the fact that there prevails a much greater respect for law than is found in this country. The English "bobby," armed only with his baton, commands more respect and more ready obedience than the American police officer who is known to carry an automatic pistol. Violators of the law are probably held in greater reprobation than with us, and the decisions even of the lower courts carry with them a greater weight of authority and public significance than those of the American courts.

One hot day, walking on an offshoot from the old royal road that leads from Marly-le-Roi to Versailles, I saw some big ripe plums fallen from the trees and lying in the road. I picked up two or three of them—they were delicious! But chancing to speak of it, in the evening to a French friend, he was horrified. "Frenchmen would not dare!" he said. "Then it is not proper?" I asked, wondering. "Not in France! Had you not been an American there might have been trouble." "Though I picked up not more than three plums, and they were not in a field, but lying in the grass in the very road? In America a pedestrian would do that on a country road without hesitation." I felt rather proud of America by contrast with this closeness of France, and perhaps I showed that I did, when he retorted with a smile: "But the matter of boundary—is it also in America that a chicken is safe only if it is not in the road?" and I had to laugh with him.[2]

May we not believe that this different attitude of respect for law is due in part to the training of the youth, in these European countries, from childhood, to give heed to authority and to hold the law in reverence?

[2] From "Unvisited Places of Old Europe," p. 105, by Robert Shackleton, 1925.

It is possible to cultivate a habit of mind which holds in honor the authority of parents, teachers and public officers; or on the other hand to cultivate a heedless attitude in which resides contempt for authority and refusal to recognize the duty of deference to law. Is it not time that the American people should proceed deliberately to cultivate a different attitude and spirit among our people—especially young people—in this regard?

Fashion and Custom

Have you ever considered what dynamic power resides in public sentiment, habits and tradition to produce far-reaching results upon the whole community?

Fashion, for example, without the sanction of law or the authority of courts and police officers, exercises a tremendous sway over the entire community. Members of the male sex wear garments that are inconvenient, uncomfortable and needlessly expensive, solely at the dictation of fashion or custom. The derby hat, ugly, hot, destructive to the hair, survived for decades simply at the dictate of fashion, and suddenly disappeared from view under the same dictation. In warm weather men wear uncomfortable starched collars, double-breasted coats and unnecessary waistcoats, simply because it is the fashion, while at the same time women are wearing clothing of one fourth the weight and are vastly more comfortable. Men wear overcoats in the coldest weather, varying in length from a short peajacket to an ulster dangling to their heels, according to the dictates of fashion.

Women submitted for generations to the most uncomfortable, unsanitary and unbecoming clothing at the dictates of fashion and then in a brief time discarded these unseemly garments and assumed sweaters, short skirts, low-heeled shoes and knickerbockers, according to occasion; but they wear furs in summer

and thin silk stockings in winter at the dictate of fashion.

Men wear straw hats in summer, but on the arrival of the fifteenth of September, though the thermometer may be 95 degrees in the shade, straw hats disappear and felt hats take their place, and when a traveler returning from Florida exhibits a straw hat before the fifteenth of May he becomes an object of curiosity or ridicule.

Similar laws rule in matters of diet. Within the past few years there has been a remarkable increase in the consumption of vegetables, with a corresponding decrease in the consumption of meat; partly, it is true, from motives of economy, but largely from the effect of education by doctors and dietitians. Similar laws operate in the field of architecture. There are successions of different architectural schools. I remember when, about 1870, French roofs suddenly became fashionable and were applied to buildings of all dimensions regardless of their fitness for the given purpose. Many of these buildings are still standing and when we see one we know it was probably not built before 1870 or after 1890. Later on, the Queen Anne style became fashionable, and multitudes of ugly houses of that order were erected.

Fashion prevails in the style of automobiles, and ultra-fashionable people buy a new machine every year or two in order to secure the latest style. A friend of mine drives a very excellent and satisfactory machine purchased almost new at less than half the original price because the owner discovered that the manufacturer had put out a car of practically identical construction but with windows of a different style.

People of moderate means drive a flivver of excellent construction at moderate cost. Thirty-five years ago there was not a millionaire in America that could ride as comfortably, or half as fast, as the ordinary citizen rides in his flivver; but owing to the popular ridicule of cheap low-powered cars the farmer soon grows discontented at driving such an inferior car, and if you count the automobiles parked on the street of any country village on a Saturday afternoon you will find that more than half of them are of more costly construction than an ordinary Ford. An American visitor at Stockholm last year observed nine automobiles parked together on a small public square. Seven of these cars were of American manufacture and only one was a Ford.

Similar laws govern other phases of human life. A few years ago no American thought of traveling third class on a steamship unless compelled to do so by poverty, but to-day thousands of students and professional people who might afford more expensive accommodations travel third class both by steamer and by European railway lines.

An illustration of the power of public sentiment to check violations of law is seen in the matter of souvenir collection. Not many years ago it was a common practice for travelers to collect articles of silver, table linen and other things belonging to hotels and restaurants and to exhibit them to a room full of friends, all laughing and joking about the cleverness which the souvenir collector had exhibited. This practice was not by any means confined to lower classes of people, but existed in a very considerable measure among those of excellent position in society. The practice may still continue to a limited extent, but no one of any social standing would dream of showing such articles to his acquaintances or admitting that they indulged in such collecting.

Application of These Principles to Law Enforcement

To a limited extent custom and fashion prevail in the matter of law observance, even where the law may occasion inconvenience or where it is contrary to one's natural prejudices. Ready obedience is given to health laws, whereby one's home is subject to medical inspec-

tion or to quarantine. During the great war and to a large extent since that time income taxes were paid with a reasonable degree of fidelity and cheerfulness. Laws designed to preserve the purity and wholesomeness of foods are being observed with increasing willingness as the community becomes more educated with reference to the advantage of those laws for the preservation of the health of the community. Laws regulating the care and removal of garbage are obeyed with increasing fidelity. An excellent example of the growing power of public sentiment in favor of obedience to law is seen in the great diminution of mob violence, especially in the south. This movement has been promoted by the voluntary cooperation of leaders in the white and black races for the education of public sentiment, assisted by the rapid emigration of Negroes to the north which threatened the farming industry in the south.

Duty of Public Officers

In order to promote obedience to law and to repress crime it is vitally important that public officers who are charged with the duty of dealing with criminals should themselves faithfully and scrupulously obey the law. It is a notorious fact that a considerable number of police officers, prison officers and even prosecuting attorneys do not scruple to violate law both officially and unofficially.

Take, for example, the practice which is known as the "third degree." It is a common thing for superintendents of police, official detectives and even ordinary policemen to subject accused persons, who may be guilty or innocent, to a rigid inquisition in which they are cross questioned, threatened and cajoled. It is not uncommon for this inquisition to be carried on for days at a time, for the prisoners to be deprived of sleep, and even subjected to physical violence. The writer made a careful inquiry into this subject in 1921 by means of an inquiry addressed to chiefs of police and prosecuting attorneys. Those who replied to the inquiry denied with one accord the use of physical violence, but most of them admitted and excused the use of prolonged and bitter cross questioning in order to extort information or confession; and a considerable number of prosecuting attorneys defended these practices on the ground that they were necessary in order to secure the ends of justice.

It is a well-recognized principle of law that every accused person is deemed to be innocent until he is proven to be guilty, and it is equally well recognized that no accused person can legally be compelled to testify against himself. In Great Britain, when an accused person is arrested, the police are required to inform him that any statements which he may make are liable to be used against him. In most of the states of the Union it is provided by law that confessions obtained from accused persons by force, threats or promises can not be used as evidence against them.

Notwithstanding these facts, multitudes of persons, innocent and guilty alike, are subjected to most bitter experiences, contrary to the laws of the land and contrary to the principles of human justice. Frequently such persons are kept incommunicado and are subjected to the treatment above described by irresponsible policemen and detectives.

We are informed that in France provision is made by law for the examination of accused persons, but it is done by a magistrate, and the proceedings are regulated by statute.

The writer has personal knowledge of the case in which a woman of high character and standing, coming from a western city for a brief stay in an eastern city, was accused of theft and was subjected for two days to a violent and insulting inquisition by two detectives. The facts of her character and standing could have been ascertained within two

hours by a telegram to the police of the city from which she came, but she was abused and humiliated to such a degree that it was difficult for her to talk about the experience thirteen years later.

The cruel and illegal use of the third degree is tacitly accepted by the public on the same theory adopted by the prosecuting attorney already mentioned, namely, that it is necessary in order to protect the community against criminals; but the competent and efficient police superintendents of Columbus, Ohio, and Berkeley, California, testified that third degree methods were entirely unnecessary and that they obtained more information and more reliable information without those methods than with them.

We believe that the time is speedily coming when public sentiment will no longer tolerate this medieval, inhuman and unnecessary practice.

Wherever the representatives of law and order themselves fail to exemplify the principles of law and order they become a force for the promotion of crookedness and crime rather than the promotion of public morals and the preservation of public safety.

Utilization of the Power of Public Sentiment

While force and fear may be recognized as necessary agents for the repression of that small portion of the community which is not amenable to those wholesome influences which restrain conscientious and patriotic citizens, is it not possible to utilize to a far greater degree than has heretofore been done those potent influences which control the actions of vast bodies of people in matters of custom, fashion, health and morals? Let the public schools, the churches, the press and all the leaders of thought and action unite in the effort to promote respect for law and obedience, not only to those statutes which fall in with the popular prejudices and desires, but also to those which call for self-denial and self-control, in the interests of the public welfare.

LAWS MEN BREAK AND WHY[1]

By the HONORABLE EDWIN M. ABBOTT
PHILADELPHIA

Since the dawn of creation man has fought against inhibitions of his freedom of thought and action. The association of people into communities brought with it the necessity of legal restrictions, but to certain individuals those restrictions have always been obnoxious and repugnant.

The tendency of modern legislation has been more and more to curb the natural predilections of man and has resulted in general confusion when authority has attempted to enforce such laws.

But the general antipathy to law enforcement is not confined to the present. It is only more general and more demonstrative.

There are so many laws that have been disregarded that it is time that something is done to ameliorate conditions. Man was never made good by legislation. He often behaves in fear of the law, and he sometimes obeys because of a desire to escape the penalty. Religion, patriotism, education and social conditions are more conducive to the higher morale of a people than all the laws of nations combined.

And it is individual selfishness that has developed a most dangerous condi-

tion. While the world is more charitable toward the needy and suffering, it has become obsessed with the demand for so-called "personal liberty," and as the wealth of this nation has been growing at tremendous leaps and bounds, with this accumulation has grown a disregard for law and the traditions upon which this nation was founded. Purists insist everybody must be pure. Liberals request every one to be liberal, and reformers in all walks of life endeavor to construct an Elysium which only the millennium can secure.

In ancient days when might was right, we had classes of all kinds. In modern times wealth and political affluence run riot through the land and we have again been segregated into classes. "Liberty" has been interpreted to mean "license" and "The Land of the Free" defined to mean, "do as you please with regard to others." The Golden Rule is gradually becoming emaciated. Therefore, men have determined that the laws of to-day which are obnoxious shall be disregarded and that most laws are made for the other fellow, anyway. Circumstances that control us under ordinary conditions are often forgotten and submerged in the desire for liberty, and so we face a general disregard of law participated in by individuals, collective groups and in many instances by states or communities.

Let us therefore consider certain laws which men will not respect and obey. The automobile laws restrict speeding, parking, lighting and rules of the road. Pennsylvania has a maximum speed of thirty miles per hour, yet automobiles are advertised to do fifty, seventy-five or even one hundred miles per hour and the owner endeavors to demonstrate that his car can attain such speed. He wants to go as fast as he pleases, drive wherever he pleases, park where he pleases and use such lights as he pleases, but the other fellow should respect the law in all particulars.

The crime of adultery might be eliminated from both sacred and profane literature. This law was never meant to be enforced in these modern days, and its usefulness is subrogated to the divorce court. It is but another restraint on personal liberty. And only in the divorce court do we have evidence that this crime has been committed. If you examine the records and read of the thousands of divorces that have been granted for this reason and then consider that rarely has a criminal prosecution been brought based upon the same facts, one must wonder if such an offense is really a crime.

In the state of New York adultery is the sole ground for absolute divorce. Yet how many inmates in the penal institutions of that state are serving time for that offense? The Mann Act covers the same offense under federal jurisdiction, but we all know that of the thousands of such transgressors few find their way into our courts. The criminal is only the poor fool who gets caught and can not adjust his differences by the monetary scale.

Gambling is another subject which touches the personal liberty of our citizens. In Pennsylvania gambling is not a crime. But certain kinds of gambling are. It is a crime to bet on an election, and while the penalty is not serious, everybody disregards this law and we never hear of prosecutions. The maintaining of gambling establishments, betting on horse races, being a common gambler and setting up lotteries or gambling devices are all contrary to law, but in the sweet name of charity some churches often recognize the innocent lottery and forget that every sale of a paddle or a chance on the sewing machine or cake is contrary to the law of the Commonwealth.

How many of us are conscientious in our returns to the federal government for our income taxes? We are instructed that our winnings at poker or other card

games must be returned as a part of our income, and that our losses should not be deducted. Have you ever met a winner who makes such a return? Are we honest with Uncle Sam in our return upon which our contribution to the support of the government is based? The commandment "Thou Shalt Not Steal" and the laws founded thereon are equally applicable to defrauding the federal government or an individual.

And that brings us to the crime of smuggling. It sounds like a harsh word, and we think of the pirates of old when we contemplate such a crime. But today it is a social event, as returning from a trip abroad with jewelry, fine linen and other purchases, the erstwhile "good citizen" contrives to get his booty home without paying the duty, and later, in the social circle he boasts how it came through with his political influence, or the tip to the Customs official. And this opens up the subject of bribery, which is such an extensive one that it reaches into many branches of trade and into every avenue of activity. Public officials seem to be the targets for bribery, and we should be thankful that most of our public servants do not succumb to the temptation. But citizens who want some favor or special privilege will not hesitate to go into our legislative halls, official offices or out into the highway and attempt by the use of money to secure what they desire. Have we carefully considered how the modern lobbyist secures special legislation? Does he always obtain votes by moral suasion—or argument?

The enforcement of the Volstead Act has opened many channels for the illegal use of money. Disregard of the Eighteenth Amendment, which is a part of our Constitution, and as much a part of the Constitution as the Bill of Rights, has led to the commission of many other crimes beside that of bribery. A most amazing condition has resulted to the body politic through the honest attempt in this city to enforce the prohibition laws. Perjury struts naked through our halls of justice, and disregard for the sanctity of the oath prevails in most of these cases. Public officials, police officials, magistrates, grand jurors, petit jurors and even some judges upon the bench forget that they are all sworn to uphold the Constitution and laws, both of the nation and the commonwealth, before they enter upon the activities of their office. Witnesses in court no more regard the oath as binding them to tell the truth, but use their testimony to their own advantage, irrespective of its truth or falsity. If jurors do not like a law they acquit defendants who are charged with transgressing it. If jurists find the law obnoxious to them they discharge malefactors convicted of breaking it. If police officials have been tainted with avarice and have fallen for a price, then memory becomes hazy and faulty, and so we have farce after farce enacted in what should be courts of justice.

There are many other crimes committed in the general disregard of law. The family physician, pressed to the limit by the exigencies of necessity, commits abortion to save the reputation of the daughter of the family which he has attended for many years.

The election official, ambitious to ascend the political ladder, takes a chance in disregarding election-law restrictions.

The so-called "good citizen" salves his conscience with exorbitant rentals of his real estate and does not consider the moral character of his tenant or the illegal purpose for which it is used.

The unthinking adult in the social circle or in the home disregards the restriction forbidding the furnishing of cigarettes to minors.

Blasphemy is still a crime, but you meet it at every corner.

The protection of health, sanitation, child-labor and factory laws to the minds

of many are impediments, and if one can forget them and evade them, well and good.

The Blue Laws are still upon the statute books. Many of them are relics of colonial days. Most of them are disregarded. Where is the legislator who will have the temerity to introduce a repealer for one or all of these acts, which are never observed?

The Narcotic Drug Act and the Pure Food Act are excellent pieces of legislation which many agree should be stringently enforced, and yet the drug addict is with us. The dispenser of such poison is only spasmodically run to earth. He even preys upon our school children and enters our homes and offices, increasing this nefarious traffic in many communities. We should be thankful that in this city a concerted effort has been made by our judges and police which has practically eliminated this terrible practice.

The pure food restrictions regarding adulteration or misbranding are evaded in many instances, and detection too often is punished with the imposition of a small fine. Seldom does any one receive a term in prison for this offense.

I might go on ad infinitum. The legislature decides we shall not have daylight saving, and individuals resent such action and do as they please. One state made it a crime to advance clocks or watches, and such an act passed the Pennsylvania Legislature in 1925, but the governor vetoed the bill. Last summer I passed through a state where changing of time-pieces constituted a crime and when I asked a good citizen if his clock was not registering contrary to law, his reply was, "Who pays any attention to such a law?" That seems to be the mental attitude of many citizens to-day.

The anti-trust laws are dying of dry-rot, and usury prevails in many garbs. The bonus is the most popular way of circumventing the six per cent. interest limitation.

Barratry and champerty are ancient crimes employed by the modern ambulance chaser, cooperating with certain lawyers and physicians. But all evade prosecutions for these offenses which they are continually committing and which are simply denoted unethical but not criminal.

Foretelling the future is also a crime, but our best citizens encourage these fortune-tellers and thus contribute support to another class of law-breakers.

I have only enumerated what must be but a partial list of laws that are only respected in the breach.

But, remember, for every policeman who accepts a bribe there must be some one who gives it. For every bootlegger who dispenses illegal beverages there must be citizens who purchase them.

The so-called crime wave is running rampant throughout the land. The populace is in hysteria in many sections. Murder, robbery, burglary, arson, rape, blackmail, kidnapping, larceny and kindred crimes are reported from every corner of this great nation.

The highwayman contends that all laws are alike and he will not respect the inhibitions against stealing. The foreigners in our midst do not respect our restrictions on his ideas developed in Soviet Russia or elsewhere and so he appropriates to his own use just what his perverted conscience demands.

How are we going to remedy this menacing and deplorable condition? The first thing to do is to try to reawaken the consciousness of all true Americans. When that is done we must act.

The first place to begin is in the home. Parents must set the proper example before their children. By precept and practice the youth of the land must be trained to walk in the paths of law-observance.

The foreigners within our bounds must be impressed with the fact that if they wish to enjoy the benefits of this great nation they must respect its laws, customs and traditions. If they refuse to do so, they should be transported back to the land from whence they came. Congress should broaden the laws allowing

us to deport all foreigners who become criminals before they have become naturalized citizens.

Every American should take advantage of the franchise. He should register and vote at every election and when public officials of any party are recreant to their oaths, they should be driven from office by a combined and determined electorate.

Every law-observing American should serve as a juror in the courts when called to that high duty. He should take his place in the grand jury room or in the jury box and see that even-handed justice is dispensed to both the commonwealth and its citizens.

When crimes are committed there should be prompt arrests, speedy trials and adequate punishments. Delays and red tape should be eliminated. Mercy should always temper justice but should not be abused. First offenders should be handled in such a way as to give them a chance for rehabilitation, but the recidivist, the confirmed criminal, should be segregated entirely from his fellows. He is a menace and should be safely interned.

The subject of adequate penalties is a most important one. The difference in Pennsylvania between misdemeanors and felonies is incongruous and means nothing from the present condition of our statute law. These differences should be abolished and all offenses should be enumerated as crimes. The more serious offenses should have more drastic punishments. Maximum penalties prescribed for many crimes should be increased.

The Ludlow Bill in Pennsylvania and all similar bills in other states should be repealed or modified and should not apply to any criminal except first offenders. The extension of parole to first offenders at the expiration of their minimum sentence should be under strict conditions, but no others should be discharged from a penal institution until they have clearly demonstrated their repentance and ability to return to society.

The system of probation and suspended sentence should only be exercised on behalf of first offenders, and those who continually break the law, especially in disregard of the liquor, food and other laws touching our social fabric, should not be allowed to escape with a fine or costs. A mandatory jail sentence should be written into the law for those who refuse time and again to obey it.

We should remember that a sentence is not only a punishment for the offender, but should act as a deterrent to others. It should serve as a reminder to all offenders to reform or take the consequences. There should be a revival of the double penalties for second and third offenses. This system is practically obsolete, although still a part of our statute law.

When prisoners are sent to penal institutions they should be given proper employment and compensation. There are many reasons for this. The most important are: To keep them employed and thus improve the morale of the institution; to teach them a trade or occupation which they can use when discharged. From their remuneration, the state should be reimbursed for the costs of prosecution and maintenance; dependents outside should be supported during the period of incarceration and a fund should always be accumulated to turn over to the prisoner at discharge for his use when he returns home and endeavors to live a law-abiding life. This would fortify him against temptation until he could secure permanent employment.

Drastic laws forbidding the indiscriminate sale of firearms and deadly weapons should be enacted and enforced. This is the most vital need of the present day.

And the pardoning power should only be exercised where extreme emergencies require it.

Could we awaken our people to the truth and make them realize that the future of America depends upon the sanity of the present we will still be in time to arrest this criminal outbreak and preserve for our children the grand heritage given us by our fathers.

HAS EINSTEIN KILLED TIME?

By Professor ALFRED C. LANE

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THERE is an impression that somehow Einstein's theory has abolished time as a separate form of reality and made it identical with space. Has Einstein then removed time from the objective external world to the world of our own consciousness? If he has it may then be true that the facts which come to us from the outside world have already been to a consciousness which grasps four dimensions. As Tennyson's "Princess" thought:

To your question now,
Which touches on the workman and his work.
Let there be light and there was light: 'tis so:
For was, and is, and will be, are but is:
And all creation is one act at once,
The birth of light: but we that are not all,
As parts, can see but parts, now this, now that,
And live, perforce, from thought to thought, and make
One act a phantom of succession: Thus
Our weakness somehow shapes the shadow, Time.

This conception implies that, as Bertrand Russell says, "the time order of events is in part dependent on the observer,"[1] or indeed, as we read in Steinmetz's "Relativity," "Time and space have ceased to be entities and become mere forms of conception."[2] Note the word "mere."

But to us even so not all is present. To the plane of our consciousness the past and the future are not the same. But what is meant by "plane of consciousness"?

Suppose we have a little crystal under a rather high-powered compound microscope. We will see only that which is in the focal plane of the microscope, and if there is an edge inclined to the microscope's focal plane it will appear as a dot, which as we focus up and down seems to change its place. There is still real motion, but not of the dot; the motion is of the focal plane.

In the microscope we see successive planes one below the other. In a moving picture we see successive films as the picture brings them one after another into view. In the moving picture things appear to move in the picture, but it is really the machine which is moving and bringing into view a series of pictures, in each one of which there is no motion, one following the other so rapidly that they seem but one to our senses. But note that in both cases there is a real change in time, and a real motion though not just that which seems to take place. In the reel all the successive stages of the motion coexist.

It is, then, perfectly possible to conceive with Einstein that all physical events, past, present and future, are equally events, but that they are not all in the focal plane of our consciousness. Thus as the apparent motion of the edge of the crystal is due to change in focal plane, so the apparent motion of a falling body is due to our being successively conscious of different positions.

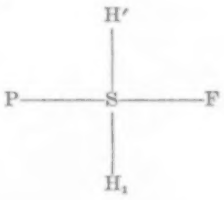
One may reply that the focal plane of a microscope has a certain depth. It is not an absolute plane. Things gradually come into focus and gradually go out again. The reply is that it is so with our own consciousness; otherwise, we

[1] "The A. B. C. of Relativity," page 44.
[2] Page 12.

should not see a color as such, for a color depends upon the time of vibrations, which are long if we are measuring them in units of the X-ray vibration. And again we should not hear a sound as such, for a sound is due to vibrations which take still more time. In other words, the present as a physical fact has a certain duration. It is then clear that we can at least conceive of our consciousness as becoming acquainted with successive belts in a four-dimensional universe just as in the case of the microscope we become acquainted with successive planes of a three-dimensional universe.

If, however, we analyze the difference between time and space, we find that time refers to change. This can only take place in time. So the minute that Einstein in his mathematics introduces the idea of change (as he does by the letter d), he is introducing the idea of time (that is, of change). On the other hand, space comes to us from the idea of coexistence. We get from what we see a form, and that form exists not by change but by coexistence. From a point there are various coexistent directions, that make angles with each other. Those angles exist independent of the number of coordinates or the number of dimensions supposed to exist in the universe. They exist in Einstein's four-dimensional universe as well. There is, moreover, no reason in mathematics or philosophy why we should stop at four dimensions, nor why we should not have five, six or seven. An angle would be still an angle. It is the great merit of Einstein that he has shown that certain actual facts of the world can be explained by the use of our dimensions. But there is no need of stopping at four. Another great savant a century hence may find facts that call for five!

I one time amused a colleague by suggesting that we add a moral dimension and represent with Einstein the past to the left (P), the future to the right (F), with Heaven above (H′) and Hell below (H_1), while the three dimensions of this present world space are supposed to be in front at right angles to them and each other.



It will perhaps strengthen our argument and make one point clearer if we consider what a change in a four-dimensional universe would mean, first, if we suppose that it is purely objective and that our consciousness is aware of but a three-dimensional film of it at a time. Secondly, if we assume there is no other time, we will try to see what is implied.

Einstein assumes no such change in his four-dimensional universe of events and therefore reduces all problems of physics and mechanics to geometric ones. This is a helpful device mathematically, but there is no more logical necessity for this than there is of limiting the number of dimensions to four. Now suppose a change in the four-dimensional universe. If time is not solely a function of our consciousness this would simply mean that another world consciousness than ours would find things different from what we had found them, or that the future when we are aware of it will be different from that which one would now prophesy.

This is conceivable and believable, must indeed be believed by those who think there is a real uncertainty even in God's mind as to what we shall become. Einstein's static four-dimensional universe implies theological fore-ordination, if there is a God.

On the other hand, if we suppose there is no time but the Einstein fourth dimension, then a change in the four-dimensional universe will mean that the future will later be different from what the future now is. Conceivably we could at least try to believe that, but could we also believe that the past will have been different from what it now is? I for one can not admit the possibility that, whereas, the Declaration of Independence was on July 4, 1776, some time later it will have been on June 17, 1775. Mind, the question is not what will prove to have been, but what it really was. I can but agree with Fitzgerald:

> The Moving Finger writes, and having writ
> Moves on: nor all thy Piety nor Wit,
> Shall lure it back to cancel half a Line,
> Nor all thy Tears wash out a Word of it.

If we assume otherwise it would be possible to say that in the Middle Ages the world would have been created by God in six days, and now it has been created in as many billion years. In the time of Dante a man might truly be bound for a literal heaven, or a literal hell, and now there may be no such place. Because I can admit the possibility of believing the latter, but not of believing the former, there is in my mind a difference between the past and future, which does not come out in Einstein's theory. Thus whether recent observations of Miller which affect the basis in facts of Einstein's theory are confirmed or not, I can admit it only as applying to the world of events which we experience in succession, and I see no reason why it should clip the speculative wings of the mathematician or philosopher, except in so far as a basis in observation indicates a static universe and supports a deterministic philosophy.

THE NATURE OF SCIOSOPHY AND SCIENCE

By Dr. DAVID STARR JORDAN
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SCIOSOPHY is systematized ignorance. Its nature was indicated more than three hundred years ago by Giordano Bruno, in Florence, who for varied heresies, for example, denying that anything was in the heavens above except space and stars, was soon after appropriately punished. "Ignorance," says Bruno, "is the most delightful science in the world because it is acquired without labor or pains and keeps the mind from melancholy."

The word sciosophy was coined by me in 1899 to meet a long-felt want. Sciosophy in action is called magic; latent magic is mystery. It differs from ordinary science in its basis. It is not derived from tested and verified human experience, because life is short and humanity demands quick returns. It recognizes no relation of cause and effect, for these are mere human devices. Instruments of precision, logic, mathematics, the telescope, the microscope and the scalpel, are not needed in sciosophy. Its processes are instantaneous and intuitional, while all scientific testing is slow and laborious. It is indeed folly to wait for this, when tradition, memory, impulse, imagination are all at hand pointing straight to truth or at least indicating that one conception is as good as another, if not better.

Sciosophy is of two classes: the one solidly based on tradition, which is our record of the guesses made by able men of the past, who labored without instruments of precision and who knew only what they thought they saw, and who tied their successors up to it. The other, having its base in imagination, knows no bounds save in degrees of vividness. The first tends to identify itself with religion, which it envelops in a cloak of mystic mist, making a merit to believe for belief's sake. The other type of sciosophy tends to make light of religion and to scoff at whatever our fathers have deemed sacred.

My interest in sciosophy, or more exactly in creating a word by which to define it, was provoked by a volume called, in English translation, "Posthumous Humanity, a Study of Phantoms," by Dr. Adolphe D'Assier, of the Academy of Sciences at Bordeaux. In this work are given many illustrations of the spontaneous activity of shadows and especially astral doubles. It is, in fact, a complete "fauna of the shades," in which are included all manner of wraiths, ghosts, shadows and phantoms, some of them wolf-like; some the ordinary astral doubles, with others due to the powerful expulsory force of the sun.

It is now well known that all animals and plants are built up of cells or chambers, each one charged with magnetic life jelly or protoplasm. These cells are never completely filled with this substance, which is in reality a vivified network, like a skein of tangled yarn. Into the cell with its network the odic forces of the universe penetrate and by their entanglement and permeation build up within a form corresponding in all respects to that of the object as a whole. It then becomes its double or negative, technically known as the "astral body," being solid only when the cell is empty and empty when the cell is solid.

The greatest interest attaches to human phantoms and especially to the activities of shadows, the most abundant creations of the shades.

A most remarkable case is that of Herr Peter Schlemihl, of Kunersdorf in Germany, as related by the noted Baron Adelbert von Chamisso, himself a man of science, the discoverer of our own California poppy, to which he gave the romantic name of *Eschscholtzia*.

It seems that Herr Schlemihl was once approached by a stranger, gray-bearded and dignified, in fact a Master of Arts. This gentleman expressed to Schlemihl a desire to purchase his shadow. A high price was named and promptly accepted. Thereupon the stranger knelt on the grass, rolled up the shadow, folded it neatly and thrust it into his knapsack, disappearing down the road between two hedges of roses, leaving Schlemihl himself absolutely shadowless.

At first the poor man thought he had made a good bargain, but afterwards whispered words and doubtful glances warned him that he was marked as a shadowless man. His anxiety soon gave him real discomfort. He set out in search of the shadow, and after many adventures he overtook the grave and serious individual to whom he had sold it.

But neither offers of money nor blows of the fist availed anything. To the former the stranger turned a deaf ear, and to the latter he used the shadow for protection. To struggle for it only served to damage the precious article itself. When Schlemihl died at last it was noticed that he left no wraith to rustle through the old graveyard at Kunersdorf.

The baron who relates this story remarks sagely that "an event had taken the place of an action, as has happened not infrequently in the world's history." This cryptic utterance is of itself typical of sciosophy. If one meaning does not satisfy, hunt up another. In Schlemihl's days such events were usually ascribed to Satan. But sciosophy now gets along without him (or with him, as the case may be). At the most he is but a "fabled fancy of an older world, the fluidic phantom of effete orthodoxy." The fact that the stranger was dressed in black, which by transmitted light looked reddish, and that his breath exhaled a faint sulphurous aroma favored the common superstition. A highly concentrated odic aura probably accounts for this. Most such concentrations have a residual odor of sulphur.

A rather well-authenticated record of the separation and independent life of a shadow is given by Mr. H. C. Anderson, of Copenhagen, a careful observer of occult phenomena. It appears that a Danish country gentleman of good family once lost his shadow. This did not worry him much until his strength began to give way and his clothing grew alarmingly brittle. Still worse, while confined to his room, he got wind of strange pranks performed by his double who seemed trying to undo him by ridicule. At last the phantom usurped his master's place at the head of the table. After this, in burning indignation, by a supreme effort of the will the gentleman recalled the phantom, to the endless mystification of the guests at the function. After this effort, his vigor returned and his new suit ordered direct from Rosenstein in Copenhagen showed no deficiency in stamina.

During the World War many appearances of wraiths are recorded. But in these disturbed conditions they might be confused with ordinary shadows, the condition of the human mind amid the glories and crudities of war being opposed to sceptical accuracy. One incident, however, vouched for by the highest authority, comes to the front and demands explanation. A well-known

lady in Los Angeles, driving along one of the many suburbs of her city, noticed on the street corner a man of unbelievable shabbiness. His manner matched his attire, and the kind lady stopped to inquire concerning his evil plight. Then there suddenly appeared on the sidewalk an elegantly dressed lady, "tailor-made" as the phrase is, who in agonized tones shouted, "Don't let him do it! Don't let him do it!"

Inquiring as to what he proposed to do, he said that he was penniless and hopeless and on his way to drown himself in the sea. The lady gave him some good advice, and still better some good money. The tailor-made lady had suddenly vanished. The beggar had not seen her at all, it appeared, but from the description he recognized his own mother, long since deceased. This incident shows that the wraith, so long a matter of pious belief, is in reality a scientific fact.

This incident also gives the clue to the remarkable fact that a wraith or detached astral body wears astral or phantom clothing. All wraiths thus far recorded appear to be properly dressed, else indeed they would be rushed by the police. The facts in this case are easily explained by the astral substance which fills the cloth cells of all garments. Phantom men wear phantom clothes, else their appearance would shock even the adept, a large percentage of adepts being ladies.

It will be remembered that in the war at Mona in Belgium the figure of an angel appeared in the heavens, seeming to urge the heroes in the trenches to "carry on." Officers and men agreed as to this vision, and none would confess that they had not seen it. After the incident had passed into history, a London humorist boasted that he had invented the "Angel of Mona" and showed documents to that effect. But the natural sciosophic answer was if his talk were really true, it was the same angel, who inspired his story, thus giving the needed publicity, for there are few adequate channels of communication between this world of confusion and the unchanging stars. The vision of Constantine, *In hoc signo vinces*, which changed the history of all Europe, at once comes to mind as the forerunner of the Angel of Mona.

Referring again to the classical work of Dr. D'Assier, he has conclusively shown that even inanimate bodies have their doubles or phantoms as well as men and beasts. It is a matter of ancient observation that cliffs and trees show shadows as distinct as those of man. The "shadow of a rock in a weary land" is classical. That shadows may be detached and yet hold a sort of life of their own is well authenticated. In a curious tale by one Barrie, of Edinburgh, a boy called "Sentimental Tommy" in running once turned a corner so suddenly that he "dislocated his shadow." It is easy to see how such an accident might occur, though not frequently. One R. L. Stevenson, also a Scotchman, tells of a boy who lost his shadow and of the embarrassments he naturally met in consequence.

There is no doubt, therefore, according to the followers of D'Assier, that the shadow of a man or a tree is an objective reality as much as man or tree itself. Phantoms are driven from their original status by the expulsory force of the sun. "The huge conical shadow of the earth which reaches beyond the moon and is called night" is not merely absence of light. It is a stark reality and for all we know may help to hold the moon in place. Its appearance marks the hour of phantoms when the odic and fluidic forces of the earth are concentrate. It is natural that about midnight should be the clustering time of phantasms of all degrees, and so it is. In daytime a shadow is seldom seen far from its host.

Towards evening, however, it asserts itself, stretching more widely, and in sleep it often becomes altogether detached, to be more or less painfully recalled in the morning.

According to D'Assier, after the death of its host the shadow wanders freely and at will. But not for long. The stars, arch enemies of shadows, soon begin to breathe and drink it up—"l'aspirent et le boivent"—and in ten to twenty days it is reduced to primeval vapor. The ever-present fear of dissolution often causes phantoms to become violently excited. In spite of their freedom to move they tend to linger about original haunts. In a few cases they find a means to suck blood from living creatures, thus, as vampires, maintaining a precarious existence. It is asserted that the swift remedy for vampires is cremation. The testimony of peasants in Little Russia bears this out, and it is plain that once drawn into a current of hot air, no phantom could ever regain its pristine form. For this reason, burning at the stake was preferred in the Middle Ages to other penalties for lack of conformity. To this fact the choice of the stake was made as the safest method with which to deal with Bruno, as with Latimer and Ridley and Servetus.

At the best the shadow's span of independence is short. This is "a wise provision of nature, for otherwise the earth would be solidly full of shadows." "The accumulation of specters of the terrestrial fauna heaped at the surface of the globe since the first geological epochs would render the air irrespirable. We could not breathe a dense atmosphere of ghosts." This is the conclusion of D'Assier, and chemical analysis of air in different localities seems to bear out his conclusions.

Unlike materialistic science, which rests on mere sensory contact, sciosophy has a foundation of principles.

First, matter rests on mind. On mind it depends for recognition which is its sole existence. Its alleged laws are mental channels only, the grooves through which the spirit passes. With your will you can cut such grooves. You can frame your own laws.

The crude notion of cause and effect, so cramping to material science, is cast aside in sciosophy. Its propositions are proved by inversion, a simple process unknown to materialistic logic. Thus the great founder of Neminism asserts: "There is no pain in truth, therefore there is no truth in pain. There is no nerve in mind, therefore no mind in nerve. There is no matter in good, therefore no good in matter."

The motto of this cult, "*Nihil nemini nocet*," is a fine illustration of the method, as in the expressive Latin the words can be arranged in three ways, always expressing the truth; thus "Nemini nihil nocet," nobody hurts nothing, proves the original thesis; nothing hurts nobody. It is rightly claimed that sciosophy is at once the complement, the opposite and the antidote to material science.

The clean-cut quick methods of sciosophy appeal to many outside the inner circles of the cult. To get there quickly is better than to wait for a generation or two. Wherefore some devotees of the most exact science have used the "running high jump," a technical term for speculative philosophy, in matters in which the old system of trial and error seems unbearably slow.

To advance by quick methods towards the infinite is one of the temptations alluringly held out to exact sciences. An aeroplane moves more swiftly than a goods van, though it may carry less weight. And while art is long, time is fleeting, and to reach finality in a lifetime is a great aim of sciosophy. If external nature has no objective existence, and one thing is as true as another, this

method of enlivening "funeral marches to the grave" is, as Bruno observed, most satisfying.

A fascinating phase of sciosophy is disclosed in the effort to probe the soul of the atom or to gauge the conscious feeling of a chopped tree. If an atom has existence, it must have a soul around which experiences cluster. If it has no existence, all the more need of a soul. If the universe is alive, and whatever is alive has feeling, why not atoms, crystals and grains of sand, as well as frogs and men? Marvelous are the achievements of the "Synthesis of Life," not a laboratory job, of course, but a task for the adept who creates life through juggling words, thus producing "a reasoned synthesis of the fabrication of protoplasm," even if he never sees protoplasm itself.

Sciosophy, as history tells us, was the basis of the wisdom of the Middle Ages. The divine right of the church, that of the king, and in later times the divine right of the state rested solidly upon it. Its basis can not be too solid, for without mystic privilege or divine intervention the modern state would be deprived of its most extensively practiced right, that of taking the lives and property of its own people in order to destroy the lives and property of other people across its borders. If you take the doctrine of science that the state is a combination or giant corporation for mutual benefit, in which each individual in some degree should be a gainer, the state has no more divinity than the wheelbarrow. Each alike would be a device for mutual help or general convenience. Under this view the time-honored formulae—the king can do no wrong, the church can do no wrong, the state can do no wrong—would dwindle into insignificance. "Hundred per cent. patriotism" and "My country, right or wrong" would lose their sacred meaning. The tested results of human experience, which are the basis of the grim philosophy of democracy, all tend towards the rule of the unfavorable mob.

In the early days of European civilization, it was the custom to follow a battle with a feast, in which the wise old men of the victors should eat the brains of the wise old men among their opponents, and the strong young men would correspondingly eat hearts of the strong whom they had bravely slain. It was a fact unquestioned that eating brains promotes wisdom, as eating hearts is known to strengthen courage. In fact, it was freely stated that but for the necessity of this bracing up of the wise and strong, there would be no purpose at all in going to war. But sciosophy remedies all this by going back to first principles. There is of course no other reason ever for going to war except that offered by divine sciosophy.

The patriotism peculiar to sciosophy is thus stated by Anatole France:

> We shall always be victorious; patriotism makes it a crime to doubt. To take up arms is to the nation's spiritual interest; even war never enriches more than a certain few. It is enough to beat the drum, wave the flag and the enthusiastic crowd rushes on to carnage and death.

In political economy, sciosophy still rules the world. It requires neither telescope nor microtome to ensure its primacy. As a nation we have been prosperous, and this according to sciosophy is due to the tariff. We have taxed ourselves rich. This we may prove best by inversion. To use war as the means to settle disputes is perhaps the greatest triumph of sciosophy. War leads to peace, for when nations are thoroughly exhausted it takes years to fatten them up. Therefore war-making is the surest means to bring about peace. This truth is proved by inversion, as peace is the surest road to war.

The most useful weapon devised for war is forged by sciosophy. It is "impersonal hate," the hatred of strangers.

Its truth is again proved by inversion. Let us assume that we call our military opponents Huns. There is no Hun in good, therefore no good in Huns.

It is said that the thirteenth was the greatest of all the centuries. In this enchanted period, learned men knew everything, or at least all that was worth knowing, for the world they lived in was a sink of iniquity soon to be destroyed and only by the blasphemous and impious, ranged with the pure planets and the eternal stars.

It was left for modern times to confuse their wisdom, to drag the purity of celestial conceptions into terrestrial mud. Not content with supplanting the divine power of direct action by Newton's law of gravitation (an effort to crowd the Creator out of His universe), they have set aside the "fall of man" by the thesis of his "ascent from the brute." The protest against this additional disturbance of predigested opinions was finely voiced some years ago by a group of sciosophists in South Carolina.

"Resolved, that Man was created by an instantaneous process without previous animal parentage." Quite recently a similar cult in Texas "reaffirms its historic stand that Adam's body was fashioned out of matter previously created out of nothing." Either of these in a single sentence, as compact as any of Lyell, Darwin or Huxley, elucidates the origin of man. And if necessary the same truth could be proved by inversion. There is no man in animals, therefore there is no animal in man.

A definite assertion like this at once clears the air and closes the door against future heresies. For nearly two hundred years the famous dictum of Archbishop Ussher had held its ground. "Heaven and earth, center and circumference, were created all together in the same instant, with clouds full of water, on October 23, 4004 B. C., at nine o'clock in the morning.

In an essay attributed to Lord Bacon, the story is told of the effort on the part of a cult of priests to find out how many teeth a horse has. Appeal was made to the Fathers and to Aristotle, but without result. Finally some one suggested looking at a horse. This was fiercely resented by the scholars. "Satan hath tempted this bold neophyte to declare unholy and unheard of ways of finding truth, contrary to all the teachings of the fathers." The disputants finally declared it to be "an everlasting mystery, because of a grievous dearth of historical and theological evidence thereof and so ordered the same writ down."

This incident has an importance in sciosophy which does not appear on the surface. It is not a matter of horse's teeth alone, but of the great principle on which traditional sciosophy rests. If we allow an appeal from authority to observation and experiment in one case, we shall be forced to do so in all. Authority would cease to be a pillar all men could lean against. Luther's appeal to "private interpretation" of the sacred books would be applied to all philosophy, theology with the rest. To "private interpretation" we owe the splitting of religious organization into hundreds of cults or denominations. Spreading its destructive influence, everywhere in human relations, it threatens most disastrous results. It has brought them on already, and even a great unifying war can not reclaim the fragments.

No discussion of sciosophy could be complete without recognition of its immediate personal values. In the words of the man on the street, "there is a good deal in it." That is one reason why its beneficial influence so long endures. The witchhazel rod is to many the staff of life. In the West, where witchhazel does not grow, any other crooked stick (especially of a tree that has water in it) will serve as well. Or the divining rod can be made of metal. If the territory is

too great to be traversed step by step, a small metallic rod may be passed over the map with equal success.

In the rush to the Klondike thirty years ago, the vender of the rabbit's foot grew wealthier than the washer of pans of gold, especially if his quarry were obtained in a country graveyard in the dark of the moon. At the present time industries based on sciosophy, such as astrology, palmology, horóscopy, kleptomania, pluviculture, and the like, are especially repaying. In our leading dailies "What the stars predict" and "What the planets tell" divide space with the "Dawes Plan" and the latest murder. In to-day's newspaper I read that "this is an unlucky day. . . . The seers predict the coming year will be as marked by vice and crime as 1924. It is possible for men to attain true greatness through science. There will be new wonders performed. Children of super talents will be born before the middle of the century. Children born on this day will be extremists, either for good or evil."

In our day, war lifted the lid on society, and secret actions and beliefs held in the dark now dance openly on every green. For the aftermath of war is the heyday of temperamentalism and of forty thousand other isms, social, political or religious, soothing to the soul and requiring no effort of the mind or hardening to the hands to secure them. "To live in two worlds at once" or in one "world with four dimensions" far from the distractions of realities is now an ideal easily obtained and earnestly to be desired.

Authority, on the one hand, a pillar to lean against, and sympathy on the other, a bosom to weep into, these are the chief demands of humanity in the mass. Both these sciosophy can furnish in full measure. No instruments of precision are necessary to set up authority or to set free the fountains of the soul, and these once flowing know no limitations of time or space. Esoteric dreams solace the future; absent treatment is better than present medicine. Its defiance of materialism proves its spiritual value. Sciosophy is ennobled by being set to work. "To cure men of all ills whatever," says a high priest of the Neministic cult, "we have only to show them the stars. When we waken in the night only the sight of the stars . . . can tell us that we are awake. When we are awake all dreams must vanish, and all is dream which breaks the serenity of the mind. . . . We need not deal with the body for the body does not exist. It is dull, heavy and aching because it is dead residuum of dream. When we forget it it is no longer there. . . . " To this in the cryptic fashion characteristic of sciosophy is added this great principle: "The equipollence of the stars above and of the mind below shows the awful unreality of evil." And as to this proposition one can have no reasonable doubt. The paragraph just quoted ends with a sudden dash of worldly wisdom. With perfect faith in the unreality of external things it matters little what the practitioner does or leaves undone. Though money has no real existence the shadow in its substance proves that there is substance in its shadow. "The population of our cities," says the high priest lately quoted, "is ample to supply many practitioners, teachers and preachers with work. To enter this field of labor beneficially to ourselves it is necessary to demonstrate that the patient who is able to pay for being healed is more apt to recover than he who withholds a slight equivalent for health." Thus he who has paid for a tonic pill of crushed lion's mane (clipped from a setter dog), or for a touch of an old bone of a king or a blessed handkerchief, or for repeating "To-day, to-day, in every way, I am getting better and better," is more likely to keep his faith than one to whom such favors come unasked. It is human na-

ture to try to get the worth of one's money. And after all, what is money as compared to health? Health is a spiritual condition not to be brought about by doctors with their pills and poultices, but an inevitable result of an adequate faith such as would move mountains.

Chemistry arose from the earnest study of alchemy, the change of base metals into gold; so has the art and science of modern medicine arisen from a branch of sciosophy. There was a time when every disease had a remedy and when the healing value of a new plant was indicated by its looks.

Another phase of this doctrine is that those drugs cure a disease which reproduce the symptoms of it. "Similia similibus curantur." And if a drug is a sure cure, a little dose is as effective as a big one; in fact neither disease nor remedy is real, and the "absent treatment," which is nothing at all, is as good as anything else if not better.

And medicine, like theology, having no recognized basis in science, split up naturally into cults. And so long as sciosophy holds its grip on the masses, so long will these cults find remunerative play. So long as "ignorance is the most agreeable of all sciences, because to secure it demands neither agony nor effort," it will be in constant demand.

I need not undertake to contrast science with sciosophy. Science is classified knowledge, no more, no less. The cardinal principle of science is that we know nothing until men find it out. There is no authority under heaven or above it that can give answers in advance to any question of fact. *"Roma locuta est, causa finita est,"* closes no scientific investigation. Science is human experience, tested and verified by our instruments of precision, telescope, microscope, scalpel, spectroscope, and those finer instruments of the mind itself, memory, logic and mathematics. Once its facts are obtained, they must be set in order. They must show relations of cause and effect, else they lead nowhere. "Facts are stupid things," Agassiz used to say, "unless they can be combined into truth," and to become truth facts must be stated in terms of human experience.

I have thus given, I trust, not unsympathetically, a few concrete examples of the most varied and most widely spread of all philosophical systems and the one most comforting to the human soul. Only a gigantic cyclopedia could tell the whole; I can only touch the fraying edge of a huge mantle which has enveloped humanity since it tasted its first knowledge of good and evil. It ranges throughout the universe from the cure of toothache and heartache through all the clustering multitudes of stars to its culmination in the ineffable, mouth-closing syllable of OM. This opens the portal of Nirvana, which is nothing at all.

In my own view the goal of human evolution is found in no single syllable, but rather in reason, religion and love. The central axis of these is reason or intelligence. Through the intellect, love and reverence are raised above the level of instincts. Each has its primal origin in simple relations. Intellect arises from reflex action, a complexity of tropisms. Love looks forward to the continuance of the race. Religion finds its initiation in fear and awe, culminating in reverence and duty. Each of these in its exalted reaches is upheld by intelligence, its organ of vision.

The term *reality* is used in psychology to denote impressions on the mind or nerve center due to the impact of external impulse. It is an objective impression as distinguished from a subjective condition. Subjective appearances of reality seen by "the mind's eye" only may be illusions. An illusion at bottom is usually a fading memory, a

continuance of a reality after its source has passed away. An untruthful interpretation of an actual reality is a delusion. Delusion and illusion form the subject-matter of sciosophy as reality forms the basis of science.

In the reality of the objective world, the integrity of science and sanity of men are alike bound up. The distinction between objective and subjective, between reality and illusion, between fact and fancy, between presence and memory, between reason and tradition, all fundamental in human psychology—each is essential in human conduct. Truth is livable and error is not, a difference which appears in the stress of the conduct of life.

The power to summon up adequate truth from our realities is called common sense. Science is only common sense expanded and verified and applied to a wider range of objects. With its instruments of precision (mind, memory, logic, mathematics and its accessory tools) it goes beyond the obvious into the hidden complexities of truth. The final test of truth is its "livableness," the degree to which we may trust our lives to it or to the methods by which it is won. It is not merely "workableness," for an idea false or incomplete may be workable in a degree. Many elements of sciosophy are workable, if not put to an acid test. That one man or ten million men get along with an idea or a dogma does not argue its soundness, unless these men have successfully translated it into action.

The relation of science to human life is in main threefold: first, to help humanity by its control of sanitation, conservation and the use of the forces of nature—this is applied science; second, to furnish a sound basis for the conduct of life—this is the art of ethics, and right living can fall back on no other authority. We must not trust to impulse or instincts, for the power to control and to discriminate among these is the function of intelligence. We can not trust to religion, for the sentiment of fear, awe, reverence and duty is sadly overlaid by superstition. It is for science to combat superstition and to disentangle religion from its meshes.

The third function of science is to widen the human mind. Its span is the universe, dealing with the infinite great as with the infinite little. We can reach a small part, not a fraction but a tangible fringe of a universe in which there is neither great nor small. We find in it endless change, but every change is orderly. So far as we can see, "nothing endures save the flow of energy and the rational order that pervades it." This intelligence we can not describe nor circumscribe. We can not speak of it in any terms of human experience, and to try to do so shows only the narrowness of our conception.

SUPERTHOUGHT

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ONE of the chief glories of the human intellect is that we can easily recognize the assumptions on which thought itself proceeds—the so-called postulates of logic. It never occurs to most of us to question those assumptions; to do so is not "common sense." But it is well to question them, because by so doing we shall arrive at extremely important results—results which lighten the labor and clarify the vision of the student of nature as well as the philosopher.

In this article we shall show that the nature and methods of our everyday reasoning are based on the physical laws of our universe, and up to the present have been seriously limited by those laws. We shall find that the mind can conquer these limitations and can deliberately set up for itself new modes of thought which have little in common with those of our fathers. Our ordinary thinking is only a special case of a science we shall call superthought until a better name is suggested. We shall discuss briefly some features which are common to all the systems of logic which are contained in superthought, and shall point out that certain great problems of philosophy are probably insoluble in terms of our normal modes of thinking.

Let us begin with a simple example to see how the structure of our logic is controlled by our physical experiences. Suppose we look at two objects A and B and find that A is like B in all respects save that they occupy different positions in space. Now let us compare B with a third object C, arriving at the conclusion that they too have the same properties. It does not follow that on comparing A with C they will be found identical. True enough, A and C have turned out identical in all cases which have arisen within the memory of man, but if we found in some instances that A and C were quite different, we should not be in difficulty. It would be an exciting game to investigate the new laws of nature—to determine under what circumstances A is C; under what other circumstances A is not C; and in cases where A is not C, to find out in what ways they differ.

The reader should look before he leaps if he feels inclined to dissent. Suppose he says that we have arrived at a contradiction; that on comparing A with B a second time we should find them dissimilar. There is no objection. It may very well happen that on performing this fourth, *absolutely independent* experiment the result will be different from that of the first comparison of A and B. The result depends entirely on the properties of space and time in the universe where these experiments are performed. We admit at the outset that such lightning changes in the essential nature of objects would be disconcerting until we learned the underlying principles upon which they depend. After all, it might be just as easy to follow the vagaries of such a universe as to understand a world in which one bacterium can start a plague and decimate a nation, or a trivial "international incident" can soak whole continents in blood.

A colony of human beings in a universe with the peculiarities described above would so mold the fabric of their thought as to cope with the situation automatically. To them the new laws governing the behavior of objects would come, in the course of a few generations, to be laws of thought. The behavior of objects in our actual world would seem to them "impossible," "incomprehensible" or even in some cases "self-contradictory."

The syllogisms which would be constructed in the new universe have a strangely unfamiliar ring to terrestrial ears. Returning to our former example, suppose that the law concerning the similarity of A and C were this: A is C from 6 A. M. to 6 P. M. but A is not C in the other twelve hours of the day. A typical syllogism would read as follows:

> A is B,
> B is C,
> It is half past nine in the morning,
> Therefore, A is C.

Such syllogisms would afford wise and convenient rules for the conduct of life in the new universe. The changes taking place at six o'clock would appear as natural to the dwellers in that universe as sunrise and sunset seem to us.

In conclusion, *the laws of logic are fundamental regularities of nature, not of mind.*

Up to this point our attack has been directed against the nature of the reasoning process. We turn now to overthrow the seemingly absolute and unchangeable character of the simple statements which form the raw material for the reasoning process. Stripped of all accessories, a simple statement is to be regarded as the symbol for a mental comparison of two objects, or of some quality of two objects. All our perceptions seem to be expressible in the forms, A is B, or A is not B. We shall concern ourselves with the consequences of the fact that the statement "A is B" is a little too strong, regardless of what A and B may represent. All that a single conscientious observer can say is, "A appears to me to be identical with B." Coincident testimony from a number of observers can not change the situation. We can never be certain that another group of observers will register the same opinion as the first. All the color-blind men in the world would call a red dress and a green dress similar. A *deus ex machina* is required in the shape of a person with normal color vision to set them right about the way things appear to the great majority of people. Perhaps a still more capable *deus*—a departed spirit, for example—could advance very cogent and subtle arguments to show that red is identical with green.

The moral of this extreme case is, *similarity and dissimilarity depend as much on the observer as on the thing observed.* We can not say in the last analysis whether one observer or one method of observation is "better" than another. The result is that we lose all basis for the comparison of objects. *Objective reality has no meaning until we specify the observer.* The philosophic arguments which center around realism and idealism are frequently valueless because of failure to specify at the beginning the essential qualities of the observer.

To give a concrete example: in the days before relativity it was believed that the length of a rod would be the same when measured by an observer at rest as when measured by an observer in motion along the rod. To-day the physicist tells us with all solemnity that when the experimenter is moving rapidly all bodies appear to be shortened in a direction parallel to the line of motion. The statement "This stick is a yard long" is true only for an observer moving in a certain way with respect to the stick. Nearly the whole essence of the theory of relativity, as far as its philosophic implications are concerned, is that it shows exactly what types of physical quantities are assigned the same value by observers moving in all possible ways, in all portions of space and at all times.

Now an object may be existent as far as one of our senses is concerned, but non-existent for another. Existence depends on the mechanism of perception and is wholly relative. We can not make much progress in devising ways and means for generalizing our modes of thought by supposing our senses perfected. That simply throws the problem

one step farther back in an infinite sequence of steps. It raises the questions connected with the existence of an omniscient being, which probably can not be solved in our ordinary modes of thought.

We arrive now at a very important question. *Is it possible that for a given observer an object could both exist and not exist, at the same time?* Of course this is impossible in our universe, and two reasons for this impossibility suggest themselves.

First, the impossibility may be due to the imperfections of our senses. Second, it may be due to some cause inherent in the structure of the universe, having nothing to do with our personal limitations. But it is the author's opinion that these two causes can not be rigorously distinguished for the simple reason that we ourselves form a part of the physical universe. Whether the impossibility resides within ourselves or in the objects around us is quite immaterial. The important thing is to construct a universe in which a thing can both exist and not exist at the same time. Unfortunately the simplest example is likely to be misunderstood by all except the mathematician and the physicist, but we shall give it for completeness' sake—in a footnote.[1] The reader who can not understand this example will have to apply to some mathematical friend, who will assure him it is easy to see through, after one has studied college mathematics for three or four years. I regret my inability to give a generally intelligible example.

Is the result to be nothing but chaos? No! It is now possible to adopt for the comparison of objects any rules that seem to be convenient or serviceable. It is possible to build a thousand systems of logic, each with its own set of rules for playing the game; to devise new types of syllogism, in which several results may follow from a given set of premises; or to devise still other types in which three or seven premises are essential before a single result can be drawn out.

With certain obvious exceptions, each system of logic can be discussed in terms of the thought forms of any other system, and finally we may hope to attain a knowledge of the actual laws of thought, if there be such; to obtain invariant relations in accordance with which the mind operates whatever be the artificial "laws of nature" which we impose on the objects presented for its consideration. It may be objected that all these logics can be treated in terms of our own system of thought. But it is well to see clearly that they can also be treated in terms of other systems. This gives us an invaluable generality of viewpoint in attacking all kinds of philosophic problems.

Let us give a practical example of the value of these methods, by discussing the existence of God. All the endless rigmarole of proofs of the existence of God would never have been written if the problem had been couched as follows:

In what types of universe, in what systems of logic, with what definitions of existence, with what definitions of the qualities of a Supreme Being, is it possible to prove the existence of that Supreme Being? Does our own system of logic belong to the class of systems in which such a proof is possible?

The generalization to other problems of philosophy is obvious.

It is well to cherish a profound respect for the unknowable. The gifted poet who wrote the book of Job mentions as an attribute of the Divine that

> He calleth the things that are not
> By name as though they were.

[1] Consider a being who dwells in a universe where time is like our space. Let him observe a particle, the space and time coordinates of which remain constant while a quantity analogous to our own time, called quasi-time, continually varies. If the world line of the particle is discontinuous, like a row of dashes – – – – –, then the particle will both exist and not exist at the same time.

TRANSPORTATION

By Professor ARTHUR CLINTON BOGGESS
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How to transport persons, goods and news both quickly and cheaply is an age-old problem which is receiving a progressive, but never complete, solution. After a brief introduction I wish to deal with the present status of transportation in this country with some slight references to conditions in foreign countries.

Our country during the earliest part of its history was narrowly hemmed in between the Atlantic coast line and the Appalachian mountains. Those mountains are not high but any student of physiography or any observant traveler who has passed over the Baltimore and Ohio railway from Pittsburgh to Washington will know that because of its rarely broken sky line the chain was all but impassable for the vehicles of colonial times. So restricted and so poor a country drove its people to the sea for a livelihood. Shipbuilding, fishing, the rum trade, the slave trade and the carrying of commercial freight of other sorts were major occupations. It was not by accident that the United States was so conspicuously successful in naval engagements in the war of 1812.

It was difficult to pass the Appalachians. It was not impossible. Pennsylvania Germans and other northerners moved down the long valleys of the mountain region to what is now West Virginia and western Virginia. The history of sectionalism in this region is a miniature of the history of sectionalism in the United States. Through the Cumberland Gap and a very few other means of difficult and dangerous egress some adventurous spirits filtered into the transmontane region, braving Indians, malaria, loneliness and the multitudinous privations incident to the pioneer.

"Develop transportation or die" might well have been the national slogan of this time. Separatist influences reached the point of imminent danger. The ephemeral state of Transylvania, the Spanish agents, the French agents, were evidences of a discontent that would not be allayed so long as our government either could not or would not provide such means of transportation as would unify its people.

The steamboat was invented none too soon. In but a few years it was followed by the steam railway. The president of the New York Stock Exchange, in an address delivered in September of this year before the New York University Forum, spoke of the early seafaring of our people and then said:

> Suddenly, however, toward the middle of the 19th century, this maritime activity and international outlook vanished. The American merchant marine was slowly abandoned, and the American shipping towns languished, never really to revive. The young men no longer took to the sea. The Stars and Stripes practically vanished, not only from distant oceans, but almost from the Atlantic as well. Abandoning the seaways, the United States turned its face to the western wilderness.
>
> This transformation, still so perplexing to Europe in some of its present day consequences, was occasioned by a major historical happening—the successful westward passage of our Appalachian mountain chain by the steam railroad. Almost at a stroke the old coastal settlements along the Atlantic were placed within easy access of what were perhaps the richest agricultural and mineral lands in the world. It is therefore little wonder that America abandoned the seaways for the landways, and that the energy of our people was diverted from roaming the seas to colonizing the wilderness. The whole country suddenly faced the

west, and became immersed in a new and vast internal conquest.

It is well, if we are to grasp the full significance of the last hundred years of American history, that we attempt to visualize the tremendous task undertaken by the early American pathfinders and pioneers. From the summits of the Appalachian mountain chain there stretched away to the westward an enormous valley, extending some 2,000 miles to the Rocky Mountains and the Pacific Coast, and an equivalent distance from the Great Lakes to the Gulf of Mexico. . . . Excepting Russia, the whole continent of Europe could be without difficulty placed inside its tremendous interior reaches. The penetration of this primeval region by the steam railroad at once imposed upon the American people the task of colonizing and bringing under one governmental control this enormous area.

Turnpikes, canals and railways vied with each other for supremacy. Lincoln remarked that people expected to navigate every damp spot. Between the danger of lacking suitable means of transportation and the danger of being bankrupt by attempting to provide such means the choice of our population varied from time to time. Panics, bankruptcies and repudiations delayed progress but could not stop it. By 1916 our railway system had attained its maximum mileage. Some 3,800 miles have been subtracted from the aggregate mileage during the last decade. Additions and abandonments take place each year. The latter exceed the former.

The records of the Interstate Commerce Commission give the reasons for the abandoning of roads. Competition of buses and trucks is insignificant as a cause for abandonment. Chief causes are the exhaustion of mines or timber tracts to which branch lines have been built and the realignment of tracks to avoid circuitous detours and thus shorten the distance between two stations.

Recent new mileage is chiefly for shortening the roads by eliminating curves and detours, for double-tracking and quadruple-tracking and for extending terminal facilities.

That the total freight carried by the railways has increased while the length of line has diminished shows that existing lines are more efficient than formerly. Within a quarter of a century our rail traffic has increased nearly 300 per cent.—from 114 billion ton miles to 338 billion ton miles. The total revenue freight carried by the New York, New Haven and Hartford in 1921 was approximately 22,000,000 tons; in 1925 it was 28,300,000—a gain of nearly 30 per cent. The total number of revenue passengers, exclusive of commuters, in 1921 was 25,200,000, while in 1925 it was only 22,600,000—a loss of 2,600,000. Commuters averaged longer trips and higher rates, however, so that the total passenger revenue increased $1,200,000 over the earlier period.

The Illinois Central System ranks as one of the leading fruit and vegetable carriers in this country and is naturally interested in moving freight as rapidly as possible. Its fruit and vegetable traffic in 1924 amounted to 1,520,794 tons. The principal commodity is bananas, imported through New Orleans, the country's largest banana port. The banana movement continues throughout the year but is heaviest during May, June and July. The movement of deciduous and citrus fruits from the Pacific Coast, approximating the tonnage of bananas from New Orleans, is almost entirely from Omaha to Chicago, with the peak movement in September. Florida citrus fruits move from January to May. Strawberries are brought from the south to the north from February or March to June or July.

The Illinois Central is spending $17,000,000 in building a double-track cutoff from Edgewood, Illinois, to Fulton, Kentucky, a distance of 166 miles. This will save twenty-two miles in the distance between Chicago and New

Orleans. The Central of Georgia Railway (a subsidiary of the Illinois Central System) is reducing grades and curves and cutting down distance on its main line between Birmingham, Alabama, and Columbus, Georgia, at a cost of about $7,000,000.

The Louisville and Nashville is spending $3,000,000 for second track and tunnels near Fort Estill, Kentucky. An aggregate of from $10,000,000 to $12,000,000 is represented in the big work which the Southern Railway System has done and is doing in Tennessee, North Carolina, South Carolina and Georgia.

Electrification of what were originally steam railways has made some progress. The Illinois Central has very recently completed the electrification of its Chicago terminal and it now operates 418 suburban trains a day on this terminal and carries in them an average of 87,000 revenue passengers daily.

Both the Virginian Railway and the Norfolk and Western Railway have electrified some hundreds of miles of their lines, thus greatly increasing their capacity for hauling coal. By the electrification of the Norfolk and Western the average train loading has been increased some 33 per cent., and the average train movements practically the same amount. This means that the track capacity has been very nearly doubled.

On the Chicago, Milwaukee and St. Paul electrification effected a reduction of 22½ per cent. in the number of trains and cut down the time of trains 24½ per cent. Thirty per cent. more tonnage can be handled in 80 per cent. of the time. Electric engines work better in cold weather than in hot weather. When almost all trains in the United States were late during the bitterly cold winter of 1917–18 the trains on the Milwaukee were on time. It is also a great relief to go through long tunnels without needing to close car windows to keep out smoke and gas.

On the Erie railroad between Rochester and Mount Morris the line has been electrified for fourteen years. It has been tied up only once on account of storms and then for only four hours. Steam tie-ups of ten hours to three days had occurred on several occasions.

The electrified terminal makes it possible for great and elegant hotels and businesses of the highest and most exclusive class to exist right alongside a great terminal. There is little noise, no smoke or steam, no hooting of engines, no human suffering and destruction of property from soot and gases.

The regenerative characteristics of electric installation are economical and efficient. The mechanism of the electric engines, when running down grade, is employed to create additional current which is stored for use by engines going in the opposite direction.

Motor bus service is rapidly increasing. One bus line runs from Chicago to Denver, another runs from Denver to San Francisco and another runs from San Francisco to Portland. Probably one can not go from Portland to Denver by bus, but he can go from Portland to Pendleton and from Greeley to Denver, thus shortening the railway journey from Portland to Denver at both ends if he chooses to do so. A bus line operates between Denver and Kansas City. A bus covers the ninety miles between Wanamaker's stores in Philadelphia and New York, respectively, in less than four hours. Well-informed authorities on transportation confidently predict that within a comparatively few years 272,000 additional buses will be added to the 70,000 now in use.

North Carolina and Florida have prospered largely because of the energy of those states in highway building. One writer says:

The improved highway is one thing which, though costing much money, nevertheless, in the end costs nothing to the state, to the community or to the individual user. It is literally something for nothing. Improved roads so greatly lessen the consumption of gasoline per mile and so increase the life of the automobile and tires that the motorist is actually making money when he pays a gasoline tax which enables him to secure good highways.

In North Carolina sleeping car buses are in use.

Probably one of the most romantic developments in motor transportation is that that has taken place in recent years in western Asia. Over the age-old Syrian desert routes American motor cars and even deluxe buses of the latest design are fast replacing the camel caravans and maintaining, in spite of such handicaps as sand storms, floods and marauding Bedouins, a regular service for the transport of passengers and mails. The motor route from India to Beirut, on the Mediterranean, by way of Bagdad, shortens the journey from India to Europe by a fortnight. My friends who come from India on furlough now come from Ur to Canaan by bus. They make better time than Abraham or Jacob, but it is only fair to add that they are less encumbered by children and other live stock than were those worthies.

A regular motor service runs from Bagdad to Teheran, the Persian capital.

The fruit growers in Honduras run their motor trucks on a narrow gauge railroad because improved highways do not exist.

Discussion has already arisen in the United States as to the practicability of subjecting motor bus lines to the control of the Interstate Commerce Commission and making tickets on bus lines, steam railroads and electric lines interchangeable.

The ubiquitous and iniquitous private motor car is too well known to demand much consideration here. For several recent seasons more than one half of the visitors to Yellowstone Park came in their own cars. Many small western towns receive an appreciable and appreciated addition to their incomes from the expenditures of tourists by automobile. Other effects of this means of transportation, together with the movement of goods by truck, are the rapid rise in land values in suburban districts, the delivery of goods by urban stores to ever-widening suburban areas, the growing difficulty of finding urban parking space and the serious problem of preserving at least some of the venturesome pedestrians. Suggested solutions, none of which has yet been tried on a large scale, are sidewalks elevated to the second stories of buildings for pedestrians, the ground level for passenger autos and electric cars and subways for trucks; zoning residential districts, restricting the height of dwellings and requiring community garages to be provided; requiring stores and factories to house, load and unload their own trucks on their own premises; requiring railways to make delivery at the premises of the ultimate consignee.

Postmaster-General New says that the government should leave to private operators the business of carrying the mail through the air. Several contracts have been let to private operators, although there are a number of government operators as well.

A new phase of transportation is the carrying of great quantities of electric energy from its point of production to any place where it is needed. This is called Giant Power. At the biennial meeting of District No. 12 of the United Mine Workers of America, held at Peoria, Illinois, in May, 1924, President Farrington pointed out that under the present method of mining one third of the coal is left in the ground and lost forever. He also said:

It costs nearly as much to haul a ton of coal from southern Illinois to Chicago as it costs to produce the coal.

It costs more to deliver a ton of coal from the car in Chicago to the bin of the consumer than it costs to mine the coal or to haul it from the mine to Chicago.

If the facts were ascertained it might also be found that it costs nearly as much to remove the ashes, cinders and clinkers from the basement of the consumer and dump them into the lake as it costs to mine the ton of coal in the first place. The city of St. Louis, for instance, is paying $2.10 for the removal of a ton of ashes.

It also might be proven that the smoke nuisance caused by the present method of burning coal in large cities is inflicting more damage to buildings, fabrics and health than is represented by the cost of production.

In these few items we have enough waste to equal more than two thirds of the price paid by the consumer. There is, however, a greater waste which is due to the present method of utilizing coal.

To obviate the present wastes the following proposal was made:

(1) The formation of a semi-public corporation in which miners, operators, consumers and the state should be represented.

(2) The establishment of one or more giant power plants on the Ohio and Mississippi rivers for the manufacture of electricity.

(3) A network of power lines to make electricity available to every hamlet and farm house in the state.

(4) The distillation of coal at or near the giant power station, in order to save the by-products of coal which are now wasted.

The benefits anticipated from the plan suggested are:

(1) An increased demand for Illinois coal through (a) The substitution of electric light for kerosene light. (b) The substitution of electric power for gasoline power. (c) The substitution of electric stoves for wood, oil, gasoline and crude oil-burning stoves. (d) The more extensive use of electric labor-saving devices in home and farm, such as washing machines, vacuum cleaners, corn shredders, etc. (e) The illumination of concrete highways. (f) The substitution of artificial anthracite for fuel oil in heating plants.

(2) A marked reduction in the price of light, heat and power at the expense of waste in transportation, selling and delivery.

(3) The stimulation of industry by a steady supply of light, heat and power, at reasonable prices.

(4) The abolition of the smoke nuisance.

(5) Cheaper fertilizer for the reclamation of farm land.

(6) Steady employment of miners.

Taking out by-products, if scientifically done, reduces the energy of coal by from 8 to 15 per cent., varying with the method and the coal used.

The south has made great progress in the use of giant power. As one result cotton manufacturing is shifting from north to south to a marked degree. The south has to-day over one half of the country's cotton mills which are consuming 65 per cent. of all the cotton manufactured in American mills; and are turning out 57 per cent. of the country's cotton goods.

Greater progress is being made in Alabama in the experimental work in connection with the utilization of electric light and power on farms than in any other part of the United States.

This giant power is expected to save coal by using the coal near the mine as has been stated. It is also true that great quantities of electric energy generated by water power can be transported long distances, if necessary, with little loss of power in transportation. This obviates the location of power-consuming factories in the often almost inaccessible vicinity of water power and makes possible the utilization of much water power formerly wasted.

One who keeps informed in regard to changes in transportation must be like Alice in Wonderland, who had to run as fast as ever she could just to keep in the same place. The issue of the *Literary Digest* for October 2, 1926, to mention a periodical not in any sense specializing in the subject, had three diverse major items in regard to various kinds of transportation. The first item stated that with an expenditure of more than ten million dollars and five years of work, during which sixteen million cubic yards of material were moved, the United States Government has converted the old Chesapeake and Delaware to a spacious sea-level canal that will be opened for general use some time in the autumn of the current year and added that at a dinner recently given by the Atlantic Deeper Waterways Association in Washington, General Taylor said: "I look forward to the time when it will be possible for a boat to go from New York to Florida, across Florida, and along the Gulf Coast to Corpus Christi, Texas, without ever going into the ocean."

The second item told of experiments made by Professor Ryan, of Leland Stanford University, on a record-breaking high voltage machine, consisting of six huge transformers, requiring more than two years to build at Pittsfield. More than one hundred miles of wire were required and the total weight is about 270,000 pounds. Its cost was about $500,000. "Looking forward to the time when power must be transmitted for hundreds of miles to meet the demands of the San Francisco territory, the set has been installed by the university so that it may solve well in advance of requirements the problems of high voltage transmission."

The third item told of the achievement of Mr. T. E. Mitten in combining in the Philadelphia Rapid Transit Company ownership and operation of street cars, motor buses, taxicabs, an interurban bus service between Philadelphia and New York City, Wilmington, Valley Forge, Washington and Atlantic City, and an airplane service from Philadelphia to Washington soon to be extended to Norfolk.

The *Classmate* for October 2, 1926, announced that on the seventh of October, at Quincy, Massachusetts, would be celebrated the centennial of the opening to traffic of the first railroad in the United States. This was a genuine and effective railroad, although its cars were drawn by horses.

Other important current projects for transportation are a deep waterway from the Great Lakes to the Atlantic by way of the St. Lawrence and another by way of the Hudson River Valley; a deep waterway from Chicago to the Gulf of Mexico; and various projects for the extension of commercial aviation and for perfecting the radio. The prediction is confidently made that before many years people can sit in their homes and both see and hear the President of the United States deliver his inaugural address and that the phonograph will be so synchronized with the movies that a moving picture house will resemble a theater with actual players present.

In conclusion it is well within the bounds of truth to say that during the 125 years since 1800 transportation facilities have developed to a greater extent than in all history preceding 1800; that the first quarter of the twentieth century saw more of such development than any other period of equal length; and that he who sits by the side of the road and watches the world go by enjoys an increasingly varied and animated spectacle.

THE EFFECT OF CONTACT ON THE SOCIAL ORGANIZATION OF THE AMERICAN INDIAN

By Professor E. E. MUNTZ
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THE contact of different race groups brings into full prominence the contrast and antagonism of their respective mores and customs. The more widely separated such societies are in culture, the more intense will be the conflict. The codes in themselves furnish a *casus belli*. Each group is imbued with the idea that its ways are the only right ones and is wont to look upon those of the other as ridiculous, perverse and even contemptible. This is especially true when it is a matter of the secondary mores, such as those centering about family customs and religion. Thus we, as members of a civilized society, regard our societal mores to be the best, the only true ones. They are adjustments for us on our present stage of economic and social development. We are used to them, brought up in them and can not, therefore, give an unbiased view of them. Consequently we are shocked and surprised when primitive man sees the ludicrousness of some of our mores and points it out to us. As far as our code is concerned the savage is acting rationally, but with respect to his own he is biased. There is no immediate verification. It is as Professor Keller says: "You can persuade a savage of the inadequacy of his stone hatchet long before he can be made to see that his family system is capable of being superseded by one yielding better satisfaction to his interests."[1] A highly developed and civilized community can not be fashioned at one stroke out of so unpromising material as a primitive race.

[1] Keller, A. G., "Societal Evolution," p. 136.

The decline and disintegration of the native social system can be attributed, in large measure, to the intolerance of the races of higher culture for the customs and mores of the backward races. This has made itself felt in many ways; for example, the direct prohibition of native customs repulsive to the code of the dominant race and the inculcation of a contempt for the ways of the ancestors in the young of the subject group. Other important reasons for the decline of the native social system are to be found in miscegenation and the selection by the "lower" group of new usages, some of which may be adaptations from the superior race, as a necessary consequence of new life conditions imposed by contact.

Of primitive customs inconsistent with the moral code of western civilization anthropophagy and human sacrifice come in for the most severe condemnation. In one form or another cannibalism has been practiced by large numbers of the American Indians. It was a common custom in the regions of La Plata. Thus Alvar Nuñez assembled all the native subjects of the king at the Ascension and solemnly warned them to give up the eating of human flesh, as that was a sin and an offense in the sight of God. The monks and clergy repeated this warning, and then presents, such as shirts, caps and other things, were presented to the natives whom they hoped to convert to Christianity.[2] The missioners saw the

[2] Dominguez, L. L., (tr.), "Conquest of La Plata," by Schmidt and Cabeza de Vaca, (Hakluyt), p. 129.

devil in every faith except their own and could not discern that such native customs as slavery and cannibalism represented early steps toward emerging from the purely savage state.[3] The Botocudos were bitterly hated by the white settlers in Brazil because of their anthropophagous habits, and wars of extermination were launched against them. The Miranhas were also notorious cannibals, though here it seems to have been a matter of blood revenge and superstition; European culture, however, has successfully uprooted the custom.[4] As is well known both Spanish and Portuguese law encouraged the enslavement of cannibal tribes. The notion that the Incas were cannibalistic and had developed human sacrifice to a great degree is denied by Cieza de Leon, who asserts that the origin of such stories was to justify the Spaniards' cruel treatment of the aborigines. Indeed, if his account is to be relied upon, the Incas were responsible for stamping out the practice of cannibalism among all the people with whom they came in contact.[5]

North of Mexico cannibalism was generally a part of war custom and was principally based upon the belief that bravery and other desirable characteristics of an enemy would pass through actual ingestion of a part of his body into that of the consumer. The idea of eating any human being other than a brave enemy was repulsive to most Indians.[6] Cannibalism is also found as an expression of affection for members of the "in-group," and frequently serves for purposes of sorcery. Human sacrifices and sacramental cannibalism exist among the Bella-coola Indians of British America. Children of the poor were purchased from their parents for sacrificial purposes; the souls of the sacrificed were supposed to go to live in the sun and become birds. When the English government prohibited this practice the priests dug up corpses and ate them. Several were thus poisoned.[7] It is the vital connection with religious mores and the supernatural which makes these customs of primitive races most difficult to eradicate.

Many times contact with the white race has caused the substitution of new customs appertaining to the higher culture for ancient usages which were quite essential for the welfare of the aborigines. For instance, the wearing of clothing in the *igloo* has proven most harmful to the Eskimo:

> The custom—an adaptation whose abrogation has resulted in sickness—was to strip upon entering the *igloo*, the temperature of which, in the absence of ventilation, is high. Thus does the skin get a chance to exhale after being inclosed in fur garments whose pores have been filled up to exclude cold. But the crowded *igloo* allows of little or no privacy. Hence the naturalness of nakedness and the absence of shame; hence also a lack of chastity and decency as judged from the standpoint of codes formed under other conditions.[8]

Letourneau sees the disintegration of the native social system pictured in the

[3] Burton, R. F., "The Captivity of Hans Stade," (Hakluyt), p. 146, note.

[4] Von Martius, C. P., "Ethnographie u. Sprachenkunde Amerika's," I, 316 and 538.

[5] Markham, C. R., (tr.), "Second Part of the Chronicle of Peru," by Cieza de Leon, pp. 79–80.

[6] Handbook of the American Indians, B.A.E., Bulletin 30, pt. I, pp. 200–1. Note: That there are exceptions to the above statement is evident from the explanation of a Miranha chief as to why his people practiced cannibalism. "You whites," said he, "will not eat crocodiles or apes, although they taste well. If you did not have so many pigs and crabs you would eat crocodiles and apes, for hunger hurts. When I have killed an enemy it is better to eat him than to let him go to waste. Big game is rare because it does not lay eggs like turtles. The bad thing is not being eaten, but death, if I am slain, whether our tribal enemy eats me or not. I know of no game which tastes better than men. You whites are really too dainty." Spix and Martius, "Brasilien," 1249—quoted in Sumner, W. G., "Folkways," p. 331.

[7] Sumner, W. G., "Folkways," p. 338.

[8] Keller, A. G., "Societal Evolution," p. 269.

disappearance of guest friendship and the acquisition of capital. For example, in the Northwest Territories of Canada there are now rich tents and poor tents, and the occupants of the latter may die of hunger without causing uneasiness to their richer tribesmen. The savages will no longer render any assistance without pay. A missionary who had given many years of his life to helping the Indians was wounded in the foot; his parishioners passed him by without offering assistance, until he called to one, who responded, "How much will you give me if I carry you?"[9]

One of the characteristic phases of Indian life was their great number of associations, fraternities and secret societies, as well as public councils and conferences. These things evolved from actual social needs and each organization, game dance, feast or custom filled some social need. "Civilization swept down upon them because they differed from our code; dances were broken up, councils and ceremonies were forbidden, and social customs frowned upon because they were 'barbarous.' "[10] In the spring of 1909 a memorial was unanimously adopted at a gathering of the secretaries of the several mission boards maintaining stations in the Indian field to the effect that "inasmuch as the sun dance and certain other Indian dances are essentially immoral in their tendency, resolved, that the Department of Indian Affairs be requested to take more urgent steps to enforce their prohibition."[11] It seems impossible for the Indian's critics to understand that the dance is not a mere amusement for him as it is with us, but that it is as replete with religious emotion as a stirring religious revival in the white settlements. If left alone there is no question that in the course of evolution the dance will disappear of its own accord, for already the Indian has lost much of the zest he used to feel for the dance, and his faith in its efficiency as a religious rite is badly shaken if not utterly destroyed.[12] This is certainly indicated at the present time by the commercializing of the Snake Dance and various religious rites by the Hopi Indians and other tribes. The magical fraternities and secret societies are also disappearing as their social need wanes.[13]

In spite of the fact that changed life conditions produced by contact with the white race has left meaningless many old social customs, they continue as survivals in the daily life of the Indian. For instance, the Peruvian Indians, even though accepting Christianity, place coca leaves in the mouth of a corpse and hang round its neck a little bag containing various seeds for its plantations in the next world. The aborigines maintain some of the old Inca customs under modern guise; periods of sowing and reaping are celebrated with merrymaking and intoxication; dances, at which the participants' dress is similar to the mode worn by the ancient Peruvians in

[9] Letourneau, Ch., "L'evolution du commerce," pp. 186–7.

[10] Parker, A. C., "The Social Elements of the Indian Problem," in *American Journal of Sociology*, (1916–7), XXII, 258.

[11] The commissioner, Mr. F. E. Leupp, points out how little the reverend gentlemen actually knew in regard to the Indian dances: "I obtained a list of the gentlemen who had voted on this proposition, and wrote a separate letter to each one, asking (1) in what respect the measures I had already taken had in his judgment fallen short, and (2) what measures he would advise my taking for the future, to the end of breaking up dancing among the Indians. The answers were interesting as a study in constructive criticism. Every voter for the memorial assured me (1) that he did not know what methods I was already pursuing, and (2) that he knew so little personally about the subject that he was unable to offer any advice."

[12] Leupp, F. E., "The Indian and his Problem," pp. 248–51.

[13] Webster, H., "Primitive Secret Societies," p. 124.

the Raymí (monthly dances), survive. These are frowned upon as relics of an inferior culture in the larger towns where the mestizo population predominates. One very interesting custom, recalling those of the Australians and other primitive peoples, of performing what the mores forbid, survives on Christmas day when the "negritos" appear. These are Indians with their faces concealed by hideous negro masks. They perform the dances of the Guinea negroes and imitate the attitudes and language of a race which they hold in abhorrence. The "negritos" parade the streets for three days and nights, entering houses and demanding chicha and brandy.[14] Many of the ancient secret societies of the Aymara Indians survive, apparently more for social than for religious purposes, although they strongly partake of a religious nature.[15]

It is, however, with respect to marriage and the family that the most far-reaching social consequences of contact with a superior culture are to be seen. In the arts and industries of native life there was a well-defined sex division of labor, and so firmly fixed was this that the Jesuits in Canada were quite unable to alter it to any appreciable extent. The missionaries were laughed at and called women when they got their own firewood or performed chores which among the Indians were allotted to the women.[16] The savages resented the interference of the whites in their domestic affairs. In Baird's relation there is an account of how the native husbands were accustomed to beat their wives for the slightest cause. One Indian, rebuked by a Frenchman for this, answered angrily: "How now, have you nothing to do but to see into my house, every time I strike my dog?"[17] The status of woman was slightly improved, however, by the efforts of the priests, especially among those peoples who were made sedentary or partially so. Marriage and the home were made more permanent; conditions of motherhood were improved, and abortion, infanticide and child sacrifice were condemned and suppressed by the priests.[18] Contact with the whites has caused a gradual decline of female infanticide among the Eskimo about Bering Strait.[19] In addition to the influence of the white man an increase in the food supply might be given as a collateral cause.

Polygamy, alien to the civilized code, never fails to excite the greatest antagonism on the part of the whites. It is most frequently a subject for regulation; likewise the looseness of the marriage contract among the natives. The Jesuits held that the best way to render marriage permanent was to establish the European custom of a dowry for the bride, reasoning that the husband would not so readily leave a wife who brought some property with her. The dowry was furnished by friends in France. Divorce was not allowed in the communities where the Jesuits had control. The Indian attitude on this question is expressed by Father Le Caron:[20]

> One of the greatest obstacles to their conversion is that most of them have several wives, and that they change them when they like, not understanding that it is possible to submit to the indissolubility of marriage. "Just see," they tell us, "you have no sense. My wife does not agree with me and I can not agree with her. She will be better suited with such a one, who does not get on with his wife. Why,

[15] Bingham, H., "Inca Land," pp. 197–8.

[16] Lee, F. E., "The Influence of the Jesuits on the Social Organization of the North American Indians," p. 76–7.

[17] Baird's Relation, "The Jesuit Relations and Allied Documents," III, 103.

[14] Von Tschudi, J. J., "Travels in Peru," pp. 337, 259–63.

[18] Lee, F. E., "The Influence of the Jesuits . . . ," p. 3.

[19] Nelson, E. W., "The Eskimo about Bering Strait," in 18th Annual Report, B.A.E., pt. I, (1896–7), p. 289–90.

[20] Le Clerq, Father C., (tr. J. G. Shea), "First Establishment of the Faith in New France," I, 221.

then, do you wish us four to be unhappy the rest of our days?

The priestly objection to polygamy frequently led to very perplexing situations. At St. Joseph polygamy was done away with among converts. But to those adherents possessing more than one wife the mandates, "Thou shalt not kill," and "Thou shalt not have more than one wife," together with the ecclesiastical prohibition of divorce, presented a very intricate problem. The missioners decided that such polygamous marriages could not be dissolved, and that a man, for instance, having three wives might be held as an adherent until two of his wives should die, whereupon conversion could take place.[21] It is interesting to note that contact with the whites indirectly increased polygamy among the Omaha. The stimulation of the hunt and commerce weakened the old village life, created new standards of wealth and lowered the status of woman. Men took to polygamy in order to get female labor to work on the pelts.[22]

One of the inevitable consequences of contact with the culture races is miscegenation. In Brazil the scanty European population took to the ways of the natives in its attempt to conform to an environment which it could not control; the adoption of the native mode of living facilitated an early fusion of races and several varieties of half-breeds came soon to be distinguished, for there was but little reason for emigration other than deportation for crime; consequently but few white women were to be found in the colony.[23] In the Amazon region to-day most Portuguese engaged in rubber gathering or trade take Indian wives. These women are of inestimable worth to their husbands, for without their knowledge of the native dialects and their influence over their own people it would be quite impossible for the ruling class to maintain the condition of Indian vassalage that exists.[24]

The objects of emigration to the Spanish colonies—adventure, conquest, etc.—virtually excluded women. The privilege of migration was strictly withheld from single women, and it was difficult to get a wife who had been left behind. Consequently there was a prevailing absence of Spanish women and mixed unions inevitably followed.[25] The official attitude was in favor of intermarriage. The lewdness of the Spaniards who cohabited with the most beautiful native women of Hispaniola gave offense to the Franciscans. Accordingly, Governor Ovando issued orders that the Spaniards must either part with their Indian concubines or marry them. Fear of losing their control over the Indians, which was considerably strengthened through these female connections, induced many of the Spaniards to marry.[26] Racial amalgamation early became a settled policy in Mexico under the rule of king and church. Charles V encouraged the legal marriage of Spaniards and Indian women, doubtless with the idea of ultimately making the population white; the church especially favored race-crossing in order to hasten the true Christianization of the people. Later, when Spanish women began to go to the colonies their union with Indian aristocrats was sanctioned by the king and urged by the church.[27] Miscegenation was brought about among some of the indomitable

[21] Lee, F. E., "The Influence of the Jesuits," p. 215.

[22] Fletcher, A. C., and La Flesche, F., in 27th Annual Report, B.A.E. (1905–6), p. 614.

[23] Koster, Henry, "Travels in Brazil," II, 167.

[24] Rice, A. H., "Notes on the Rio Negro (Amazonas)" in *Royal Geographic Journal*, Oct., 1918, p. 213.

[25] Moses, B., "The Establishment of Spanish Rule in America," pp. 58–9. Bourne, E. G., "Spain in America, 1450–1580," pp. 265–6.

[26] Kerr, Robt., "Gen. History and Collection of Voyages and Travels," III, 387–8.

[27] Thompson, W., "The People of Mexico," p. 29.

native groups in Chili by the natives carrying off white women whom they captured in raids made upon the Spanish settlements.[28]

Although there appears but little reluctance on the part of most native races to alliances with the whites, the Tarahumares of Mexico form a notable exception. Until very recently light-colored children were not liked and half-caste babies were frequently left in the woods to perish or given away to be adopted by the Mexicans. Mothers even yet anoint their little ones and leave them in the sun that they may get dark. The general opinion is that half-castes turn out to be bad people and "some day will be fighting at the drinking feasts." In the border districts, however, intermarriage with the Mexicans is noted with increasing frequency.[29]

North of Mexico the French intermarried to the greatest extent with the aborigines. French colonists were prone to see in the Indian a fellow human being; to recognize the native's pride and prejudices, and finally to win his confidence by respecting his institutions and often sharing in his ceremonies.[30] The French priests would fain have adopted the Indian as a countryman and even proposed that a number of young Frenchmen should settle among the Hurons and marry their daughters in solemn form. The aborigines were gratified with so pleasing an overture. "But what is the use," they asked, "of so much ceremony? If the Frenchmen want our women, they are welcome to come and take them whenever they please [referring to the traders] as they always used to do."[31]

The various fur and trading companies established for traffic in the regions west of the Great Lakes and in the Hudson Bay country were particularly influential in altering the social life of the natives. They brought into their habitat a class of men, French, English and Scotch, who were not adverse to taking native wives. This was favored by the great fur companies as the best means of exploiting the country in a material way.

The Cree and Chippewa have perhaps furnished the most mixed bloods, followed by the Sioux, Ottawa, Menominee and tribes about the Great Lakes. Some intermixture of captive white blood is noticeable among the Apache, Comanche, Kiowa and other raiding tribes along the Texas and Mexican borders. The Pueblos have never favored intermarriage with the whites. The Five Civilized Tribes of Oklahoma—Cherokee, Choctaw, Chickasaw, Creeks and Seminole—have a large element of white blood, dating back in some cases to British and French traders before the Revolution. The Cherokees, in particular, have encouraged fusion, for under the former laws of the nation any one who could prove the smallest proportion of Cherokee blood was rated as Cherokee, including many of one sixteenth, one thirty-second or less of Indian blood. The Cherokees have drawn the color line very strictly with reference to Negroes, but others have intermarried freely. In 1905 there were over twenty thousand adopted Negroes in the territory belonging to the Five Civilized Tribes. Many of these Negroes are descendants of slaves formerly owned by the Indian tribes. The Pamunkoy, Chickahominy, Narragansett and Marshpee remnants have much Negro blood, and it is probable that many of the broken coast tribes have been completely absorbed into the Negro race.[32]

[28] Ulloa, Don Antoine de, "Voyage de l'Amerique," I, 65–6.

[29] Lumholz, C., "Unknown Mexico," I, 417–8.

[30] Handbook of the American Indians, B.A.E., Bull. 30, pt. I, 475.

[31] Parkman, F., "The Jesuits in North America," I, 226.

[32] Handbook of the American Indians, Bull. 30, pt. I, 914.

Considerable race-mixture occurred in the northwest through Russian traders. The whites, either by force or agreement, compelled the Aleuts to hunt for them and to give hostages, generally women and children. The Aleuts were thereupon given traps and sent forth to hunt for the season, while the Russians lived in indolent repose at the village, basking in the smiles of the wives and daughters and using them as they saw fit. In spite of the apparent cruelty of the Russians they were much preferred to other Europeans, because they assimilated more readily with the aborigines than did the other traders. They lived together with and in the manner of the natives.[33] In view of the hostage system and the character of the Russian trader it is questionable if his presence had anything more than a destructive influence upon native social life and customs. Wholesale miscegenation has taken place in Greenland, and it is difficult to find a pure-blooded Eskimo on the west coast. "The native women prefer the worst Dane to the best Greenlander and the half-breeds are the more eligible for their strain of white blood; illicit relations with white men are rather a glory than a disgrace." Race mixture is favored by the Danish government, but the mongrels resulting from these alliances do not appear noticeably superior to the native stock.[34] Among the Point Barrow Eskimo prostitution is carried to a shameless extent with the sailors of the whaling fleet by many women and is even considered a laudable thing by the husbands and fathers, who are always willing to receive the price of their wives' or daughters' frailty.[35] The purity of the race has steadily declined.

That miscegenation has had a profound effect upon the social life of the American Indian is not open to doubt. The half-breed, finding that the native race from whence he has sprung is undervalued or despised by his foreign parent, seeks to alienate himself from it and hastens to abjure its customs and prejudices and all community of feeling with those who belong to it. On the other hand, he is unable to adopt the ideas and assume the pretensions of Europeans and is constrained to take an intermediate station. In this position, uncontrolled by the usages or the habits of thought peculiar to either race, unable to identify himself with the one and unwilling to align himself with the other, he becomes, as it were, negative in the scale of society, and remains a conspicuous example of one of the many ills which are entailed upon uncivilized nations by contact with races of superior culture.[36] The half-breeds of northwest Canada class themselves as the equals of the whites and look patronizingly at the Indians.[37] Humboldt was anything but enthusiastic over the results of the mixture of races in Mexico; the product is described as lazy, carefree and considerably below the mulatto in activity.[38] It may be accepted as a general rule that wherever Spain held sway in America the immigrant Spaniard held in contempt the creoles, and especially the mestizos, who formed the industrial element in the colonies; the mixed races felt superior to the native or Negro stocks from which they had sprung, and the Negro, with his superior strength and the favor of his master, treated the Indians with insolence and scorn. The different shades of color were classified

[33] Bancroft, H. H., "History of the Pacific States," XXVIII, 235–6, 250–1, 339.

[34] Keller, A. G., "Colonization," p. 515.

[35] Murdoch, J., "The Point Barrow Eskimo," in 9th Annual Report, B.A.E., (1887–8), pp. 419–20.

[36] Howison, J., "Views of the Colonies," II, 336.

[37] Reid, A. P., "Half-breed Races of N. W. Canada," in J.A.I., IV, 48.

[38] Humboldt, A., de, "Neuvelle-Espagne," II, 37–8.

most minutely not only by the force of custom but also by law. Each caste envied those above and despised those below.[39]

Thus among primitive peoples whose customs were sanctioned and upheld by centuries of tradition came representatives of the white race with customs and teachings completely at variance with Indian usage. The very impact from the clash of two so widely different cultures could not fail to materially affect the social life of the "lower" races. The Indian's first adjustments were in the economic field, but it was not long before changes were produced in native societal life as a consequence of imitating the ways of the whites, the selection of new mores in accord with new conditions, the prohibition of native customs inconsistent with the code of the European, the education of the young and the growth of new social groups with the fusion of the European, African and Indian, possessing nothing but contempt for the ways of the aborigines.

[39] Keller, A. G., "Colonization," p. 220; Leroy-Beaulieu, P., "De la colonisation . . .," I, 11.

GAPS IN THE MONGOLIAN LIFE RECORD

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PART II

THE Third Asiatic Expedition has discovered in the rocks of Mongolia a splendid record of earth history and an equally wonderful record of the life of past ages. But these records themselves are far from being the whole story; in fact, their great value is that they supply certain parts of the story that are missing elsewhere and that they agree so closely with what has already been worked out in other parts of the world. If the story of earth history and the history of past life as generally accepted by scientists were merely the first crude attempts to formulate the complexities of nature it would be found that after a great new world was discovered the older theories would collapse under the mass of new facts placed upon them. But in this case the newly discovered geological formations fit admirably into the geological column based on the record built up of comparative studies on all the great land masses of the world, while the new fossils cause only a widening of our outlook and no revolutionary upset of the existing classification, so that the sciences of geography, geology and paleontology have stood well the pragmatic tests imposed by the discovery of thousands of new facts.

In order to show how the Mongolian records of past life fit into the story as a whole, let us review briefly the general outline of the evolution of the vertebrate animals as it has been deciphered before the Third Asiatic Expedition began its explorations.

It is not yet generally agreed how the vertebrates, or backboned animals, arose, that is, from what group of invertebrates they started upon the career that culminates in the evolution of man. Mongolia, like other land masses, has hitherto failed to yield the decisive evidence. The oldest fish-like vertebrates so far known, which date back to the Ordovician of Colorado, already had obtained a whole series of "basic patents," or fundamental mechanical arrangements, which they transmitted to their remote descendants, the fishes and land-living vertebrates of later ages. They and their descendants of the Silurian and Devonian ages had already solved the problem of capturing food and energy from the environment with the aid of a complex apparatus for locomotion of the vertebrate type. For this object their bodies were built on streamline forms, they moved by the contraction of a series of ≷ -shaped muscle segments placed on either side of a stiff elastic rod, the notochord, their sense organs and brains were already built up into a head of vertebrate type and they had pouches from the throat called gills for extracting oxygen from the water.

By early Paleozoic times the primitive fishes had already adapted themselves for life in the inland waters of the great land masses. Some of them that lived in foul waters gradually took to gulping air from above the surface of the water and storing it in a special sack from the throat which eventually became a lung. Certain of these air-breathing fishes developed stout paddles, a pair behind the throat and another about the middle of the body, and these paddles correspond precisely to the two pairs of limbs that even man himself still possesses. Some of the air-breathing fishes with stout paddles struggled out of the

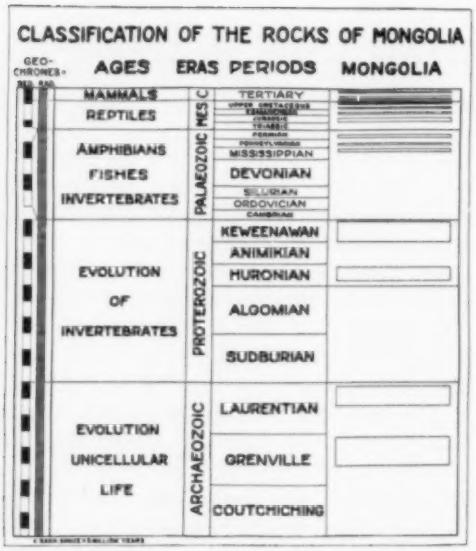


FIG. 1. GEOLOGICAL SEQUENCE OF THE ROCKS OF MONGOLIA

THE STANDARD GEOLOGICAL DIVISIONS ARE SHOWN IN THE MIDDLE COLUMN, MONGOLIAN FORMATIONS IN THE RIGHT-HAND COLUMN (AFTER MORRIS).

pools in the swamps where they lived and thus gave rise to the swarming amphibians of the oldest coal-measures. The eggs and young of these animals still passed through a fish-like, water-living stage of development, like the tadpoles of frogs and salamanders, but the adults had the form of four-legged animals capable of crawling on the ground. Very early in the coal-measures time some of these early amphibians succeeded in rearing their young completely on land, the fish-like stage being passed through within the egg, and thus the great class of reptiles arose. By the time of the Permian or close of the Paleozoic era the reptiles in turn had begun to divide into many branches, some of which later gave rise to the dinosaurs, marine reptiles, flying reptiles and mammal-like reptiles of the "Age of Reptiles" (Mesozoic era).

THE AGE OF REPTILES IN MONGOLIA

The rocks of the oldrock floor of the desert of Gobi are either of marine origin or are so thoroughly modified by washing, heating and other processes

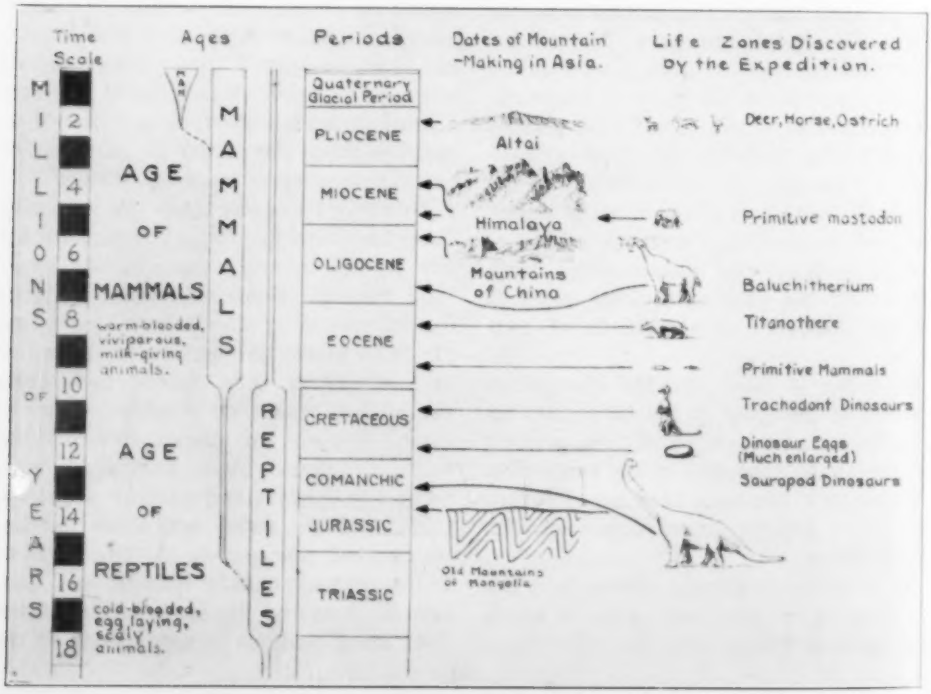


FIG. 2. SEQUENCE OF LIFE IN MONGOLIA (AFTER MORRIS).

that they have so far yielded no part of the story thus briefly outlined. But above the oldrock floor the sedimentary strata are all of continental type and the record of vertebrate life begins with the Cretaceous or last epoch of the Mesozoic, or Age of Reptiles. Although by this time the closing chapter of the history of the dinosaurs had been reached, Mongolia supplies some important pages in it.

The American Museum fossil hunters in Mongolia are constantly reminded of scenes familiar to them in the great fossil-bearing basins of the Rocky Mountains and Great Plains. We can imagine then the thrill that Mr. Walter Granger experienced when at the Red Mesa of the Oshih Basin in Western Mongolia he picked up a fossil tooth which he instantly recognized as establishing the former presence in Mongolia of gigantic amphibious dinosaurs akin to the *Brontosaurus* which he himself had excavated many years ago in Wyoming, the sixty-foot skeleton of which is now mounted in the American Museum in New York. And how exciting it was to find a similar tooth about two hundred yards away, then several badly weathered limb bones, and finally three miles away and on a somewhat higher level, a couple of gigantic vertebrae with several long ribs. And how tantalizing to Mr. Granger and his small party that the expedition must move on and that the ribs and vertebrae were too badly weathered and disintegrated to be worth excavating and that there was not another scrap visible in the whole basin. But even the three teeth that were brought home to the American Museum afforded some valuable information to Professor Henry Fairfield Osborn, who described them. Somewhat spoon-shaped or spatulate, they differed only in minute details of form from those of the lumbering giant named *Camarasaurus* from Colorado, Utah and Wyoming, and appeared in fact to represent a new genus of the same family. On the other hand, they differed considerably from the long pencil-like teeth of the slender-limbed, swan-necked *Diplodocus*, the companion of *Camarasaurus* and *Brontosaurus* in North America.

Here then was a new and astonishing link between Mongolia and our own west. Did the giant long-necked amphibious dinosaurs originate in Mongolia and then spread by the Behring straits route to northwestern America, or did they first develop their peculiar habits and body form perhaps in Europe, where their representatives are known in equally-old and much older formations, and then spread to Asia, North America, South America, India and Australia?

The ponderous *Asiatosaurus*, as Professor Osborn named this huge earth-shaking beast, was not allowed to wax fat in the land of plenty without having a relentless enemy to prevent him from possessing the earth. Ferocious flesh-eating dinosaurs, alert bipeds with huge jaws and saw-edged teeth, like those of *Megalosaurus* of England or of the *Allosaurus* of Wyoming, left a couple of their teeth in the same beds with those of the *Asiatosaurus*. That these great flesh-eating dinosaurs did prey upon the amphibious dinosaurs or sauropods is indicated by the fact that in Wyoming some sauropod vertebrae were found with tooth marks on them which seem to have been made by the teeth of *Allosaurus*, the contemporary flesh-eating dinosaur. Here then was another link between Mongolia and Wyoming, the peculiar association of sauropods and carnivorous dinosaurs.

In the same Red Mesa the bright eyes of Wong, Mr. Andrews' Mongol chauffeur, discovered one of the most valuable fossil skeletons of the entire expedition. This was afterward named the parrot-beaked dinosaur (*Psittacosaurus*) and was described by Professor Osborn. Although apparently adult the total length from snout to tail-tip was only about four feet, four inches. The skeleton is now exhibited in the museum in

Photograph by American Museum of Natural History

FIG. 3. *CAMARASAURUS SUPREMUS*
AN AMERICAN RELATIVE OF *Asiatosaurus* (AFTER OSBORN).

approximately the same position in which it lay in the rock; but by means of a series of careful drawings of the individual bones it was possible to make an accurate reconstruction of the animal in a running position (Fig. 4). That it ran upon its hind legs is suggested not only by their much greater length as compared with the fore limbs but especially by the detailed anatomical characters of the pelvis, which is of the bird-like, bipedal type.

Small, bipedal, beaked dinosaurs have been found in Wyoming in the same formation with the great sauropods and carnivorous dinosaurs; but the Mongolian *Psittocosaurus* differs from its American and European relatives in the parrot-like form of the beak. *Psittacosaurus* was evidently herbivorous like his American and European relatives, since the cheek teeth formed a cutting and grinding surface suitable for shearing tough vegetable tissue. The jaws and skull were very stout and the jaw muscles very powerful, in order to operate effectively the piercing beak and the shearing cheek teeth. Possibly the reptile fed on the somewhat pineapple-like fruits of the cycads.

Interesting mechanical adaptations are seen in the jaws of *Psittacosaurus* (Fig. 9, A) and of all other beaked dinosaurs, the upper and lower jaws acting somewhat like nutcrackers, since they are hinged both above and below. The beak acts like a pair of spring shears, with the power applied between the resistance and the fulcrum. The joint between the lower jaw and the supporting pillar of the upper jaw is below the level of the cheek teeth, whereas in more primitive reptiles this joint is in line with the cheek teeth. This arrangement is carried to an extreme in the later beaked dinosaurs. It not only gives an increased vertical space for the jaw muscles but makes it possible to increase the height of the cheek teeth, thus lengthening their period of usefulness, besides putting the lower teeth in an advantageous position to sweep across the upper teeth in an oblique or nearly vertical plane, in the cutting of tough food.

The pelvis of this interesting reptile shows a peculiar combination of characters; for while its prepubis is short, simple and not expanded or plate-like, its backwardly directed true pubis already shows the first stage in the secondary reduction or degeneration of the pubis, which culminates in its almost complete loss in the horned dinosaurs or ceratopsians. The opposite ischia are produced into a channel, the upper sur-

face of which has been called the "egg chute."

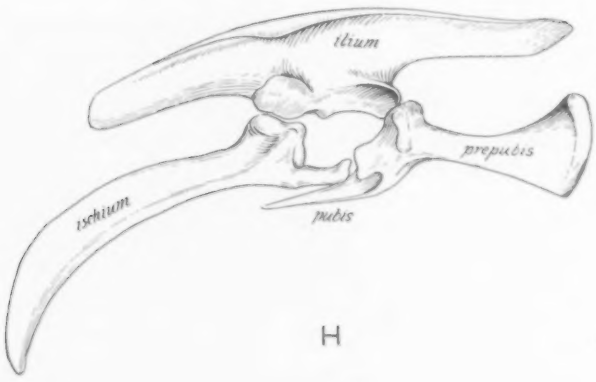
Egg-layers and Egg-stealers

This brings us directly to the subject of dinosaur eggs, perhaps the most famous discovery of the Third Asiatic Expedition. Andrews has already told the story of the discovery of these eggs, but why do we feel so sure that they are the eggs of dinosaurs rather than of other reptiles or birds? First, these eggs have been pronounced by several experts after careful examination to be different from the eggs of all known crocodiles, turtles, lizards and birds. Second, the eggs are very abundant in a formation from which seventy-odd fossil skulls or skeletons of a certain beaked dinosaur (*Protoceratops*) have been taken and in which other animals are quite rare. Third, the same formation has yielded a whole series of growth stages of this same dinosaur *Protoceratops*, some of the little skeletons being almost small enough to be newly hatched from the eggs. Fourth, some of the eggs contain partly ossified skeletons of the young animals and the appearance of the bone is quite like that of the smaller skeletons of *Protoceratops*. Fifth, the microscopic structure of these eggshells, as reported by Professor Van Straelen, of Belgium, while strikingly different in details from those of nearly all known eggs, living or fossil, is fundamentally similar to that of the supposed dinosaur eggs from Rognac in southern France. Hence it may be taken as sufficiently proved that the "dinosaur eggs" are truly eggs of dinosaurs and further that they belong to the beaked dinosaur known as *Protoceratops*.

Now as to the remarkable animals that laid the eggs. The first discovered skull of the reptile now called *Protoceratops* was found on the Kwei-hwa-ting trail, east of the Artsa Bogdo range, Mongolia. When sent home to the laboratory of the museum in New York the skull was still buried in the rock and no one knew what it was or had yet seen more than a small part of it. As the rock was gradually cleared off and the beak-like snout came into view our wonder increased, for at that time no other small reptile was known with a face like this one. When the lower jaw came into

Photograph by American Museum of Natural History

FIG. 4. SKELETON OF *PSITTACOSAURUS MONGOLIENSIS* OSBORN (AFTER OSBORN). RESTORED PARTS IN DOTTED LINES.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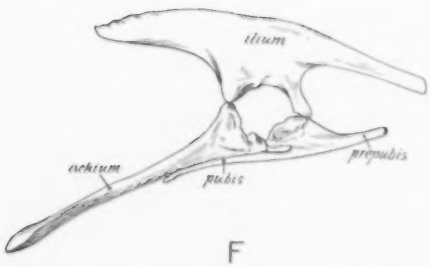
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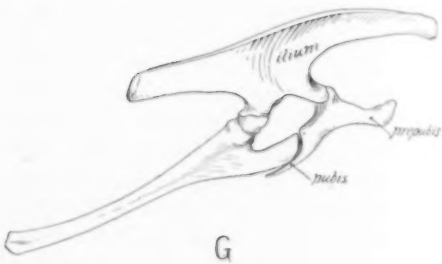
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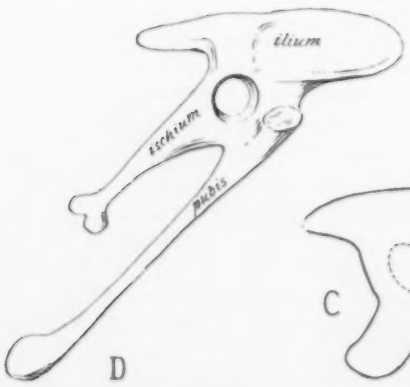
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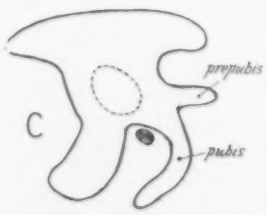
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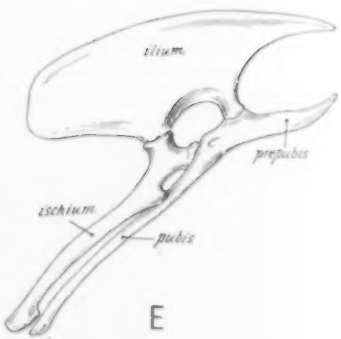
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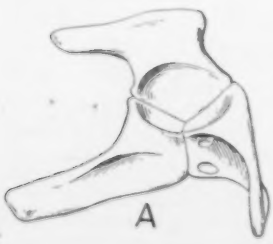

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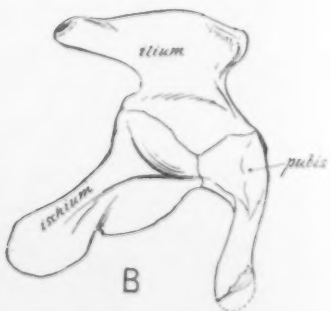
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view we saw that it possessed a "predentary" bone at the front and gradually we realized that we were looking for the first time at an Asiatic representative, and probably an ancestor, of the great horned dinosaurs or ceratopsians, which up to that time were known from numerous skulls and a few skeletons from the Cretaceous, chiefly of Wyoming, Montana and Alberta. But our Mongolian specimen was a very small form with a skull about six inches long and no bony horns or outgrowths above the nose or eyes, while some of its gigantic American relatives had skulls six feet in length with great horns or bony outgrowths above the nose and eyes. Moreover, the back part of our specimen was broken and we did not know whether or not it possessed a bony "frill" or shield, extending upward, backward and outward over the neck. Nevertheless, the detailed evidence of relationship to the ceratopsian dinosaurs was so unmistakable that Mr. Granger and the present writer did not hesitate to baptize the little Mongolian skull as "*Protoceratops andrewsi*," the first of the horned dinosaur group, the species being named in honor of the leader who had opened up this great new world of past life.

During the years 1923 and 1925, the Third Asiatic Expedition made a great collection of the remains of these dinosaurs, including some seventy-odd skulls and skeletons, many of which have since been worked out of the rock. In the second paper on *Protoceratops*, the present writer, in collaboration with Dr. Mook, showed how *Protoceratops* completely realizes the implications of Dollo's inference that even the great horned dinosaurs were secondarily quadrupedal in posture, that is, that they had been derived from bipedal ancestors. For *Protoceratops*, while probably spending most of its time on all fours like the later ceratopsians, and while unmistakably foreshadowing the latter in many features, at the same time differs from them in retaining a series of peculiar characters in its skeleton which it has apparently inherited from bipedal ancestors that in many ways resembled *Psittacosaurus*. For example, its hind limbs are much longer and larger than its fore limbs, the hind foot being narrow and much longer than the fore foot, almost as it is in the bipedal *Psittacosaurus*, while in the more advanced quadrupedal ceratopsians of later times the hind foot was much broader and little, if any, longer than the fore foot. Again, the tibia or shin bone is longer than the femur or thigh bone as in running, beaked dinosaurs. The pelvis is more advanced than that of *Psittacosaurus* in the greater lengthening of the ilium, further reduction of the backwardly directed pubis, initial expansion of the prepubic process and slight downward curvature of the elongate rod-like ischia. These and other modifications of the pelvis indicate that *Protoceratops* at least spent more time supported on all

FIG. 5. EVOLUTION OF THE PELVIS IN BIRD-LIKE DINOSAURS AND BIRDS

RIGHT SIDE, FRONT END OF THE PELVIS TOWARD RIGHT. A. PRIMITIVE PELVIS OF SMALL LIZARD-LIKE REPTILE (*Euparkeria capensis* BROOM) FROM THE TRIASSIC OF SOUTH AFRICA. B. FOSSIL REPTILE (*Erythrosuchus*, AFTER BROOM) FROM THE TRIASSIC OF SOUTH AFRICA. THE PUBIS IS BEGINNING TO GROW DOWNWARD AND SLIGHTLY BACKWARD. C. EMBRYO BIRD (*Apteryx*, AFTER PARKER). THE PUBIS IS GROWING DOWNWARD AND BACKWARD IN FRONT OF THE OBTURATOR NERVE (OVAL SPOT). A PREPUBIS IS PRESENT. D. *Archaeopteryx*, JURASSIC BIRD (AFTER ABEL). THE PUBIS IS DIRECTED BACKWARD. THE PREPUBIS IS REPRESENTED BY A LOW HUMP IN FRONT OF THE SOCKET FOR THE FEMUR. E. SMALL BIRD-LIKE DINOSAUR (*Laosaurus consors* MARSH) SHOWING PUBIS PARALLEL TO ISCHIUM. FROM THE JURASSIC OF WYOMING. F. *Protiguanodon mongoliense* OSBORN. THE PUBIS IS REDUCED TO A SLENDER ROD. FROM THE LOWER CRETACEOUS OF MONGOLIA. G. *Protoceratops andrewsi*. THE PUBIS IS REDUCED TO A VESTIGE. FROM THE CRETACEOUS OF MONGOLIA. H. *Triceratops prorsus*. THE PREPUBIS IS GREATLY EXPANDED. FROM THE UPPER CRETACEOUS OF NORTH AMERICA.

Photograph by American Museum of Natural History

FIG. 6. DINOSAUR NEST

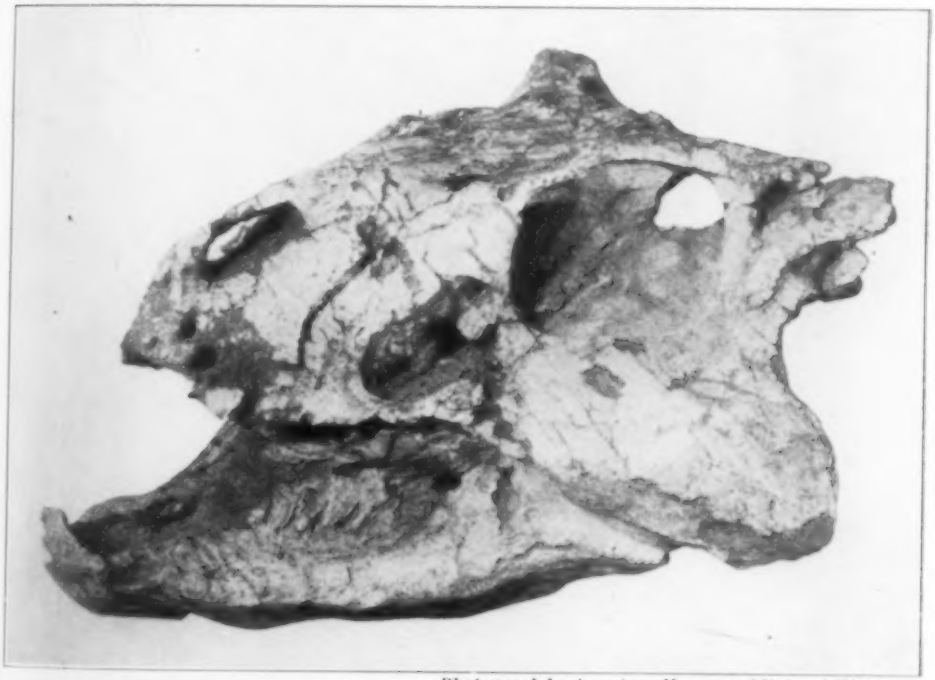
THIRTEEN EGGS IN BLOCK AS MOUNTED IN THE AMERICAN MUSEUM OF NATURAL HISTORY.

four legs and less time running on its hind legs than did its less modified neighbor *Psittacosaurus*, while the enormous size of the head and jaws in proportion to the size of the backbone and thorax, as well as other marked specializations for the eating of herbivorous food, all give added reasons for the increased use of the quadrupedal posture and the gradual abandonment of bipedal running. Thus the *Protoceratops* was now getting big enough to stand and confront a hungry enemy, doubtless threatening him with his fierce beak, and no longer needed to turn and flee away on his hind legs.

The skull of *Protoceratops* shows very pronounced modifications in the direction of the later ceratopsians. In the very earliest reptiles the whole surface of the skull behind the eyes was formed by a continuous shell of bone which covered over the jaw muscles. But by the time of the oldest dinosaurs this formerly continuous temporal region had become perforated by two prominent openings called the upper and lower temporal fossae. Between these openings were left strengthened tracts or arches, an upper middle pair, the parietal crest, between the upper temporal openings, a second pair, the postorbital arches, above and behind the eyes, and a lower pair, the jugal arches, just above the lower jaw. In such relatively primitive beaked dinosaurs as *Psittacosaurus* the jaw muscles were of moderate size and the temporal arches did not extend much behind the joint between the upper and lower jaws. But in *Protoceratops* the jaws and jaw muscles had become very large and in so doing had pushed their supporting arches upward, backward and outward, so that the skull is prolonged in the rear into a great spreading crest or frill. Formerly it

was believed that this crest or frill, which is even further developed in the later ceratopsian dinosaurs, was evolved for the protection of the neck, but the construction of this region in Protoceratops plainly indicates that it functioned primarily as a scaffolding for greatly enlarged jaw muscles.

Are we to conclude then that the horned dinosaurs (ceratopsians) acquired their special characters in Mongolia and then spread via Manchuria and the Behring Straits or Aleutian Islands route into Alaska and thence down to the Rocky Mountain region? We can not safely affirm this on the evidence afforded by any one type of animals, but we can affirm that there must have been some means of migration either in one direction or another. Some years ago Mr. Barnum Brown, of the American Museum of Natural History of New York, discovered the fragmentary skeleton of a small horned dinosaur in the Edmonton Cretaceous, Alberta, which he clearly saw was distinct from the larger horned dinosaur and to which he gave the name *Leptoceratops*. It is now evident that *Leptoceratops* is quite nearly related to Protoceratops and that it represents a little-changed descendant of the latter in North America at a time when the typical ceratopsians had reached the summit of their period of specialization. Some paleontologists will undoubtedly take this fact to mean that the larger ceratopsians were not descended from *Protoceratops* but from some undiscovered stem form. However this may turn out, it is safe to predict that even if *Protoceratops* be not the direct ancestor of the great horned dinosaurs, it was at least rather closely related to that ancestor and shows us a stage in which the ceratopsians had just acquired secondary quadrupedal habits



Photograph by American Museum of Natural History

FIG. 7. *PROTOCERATOPS ANDREWSI*, TYPE SKULL.
OBLIQUE SIDE VIEW. ABOUT TWO THIRDS NATURAL SIZE.

FIG. 8. *PROTOCERATOPS* AND YOUNG
RESTORATION BY E. R. FIELDS.
Photograph by American Museum of Natural History

FIG. 8. *PROTOCERATOPS AND YOUNG*
RESTORATION BY E. R. FULDA.
Photograph by American Museum of Natural History

FIG. 9. THREE STRUCTURAL STAGES

NOT IN DIRECT LINE OF SUCCESSION, ILLUSTRATING EVOLUTION OF THE FRILL AND OF HORNS IN THE FRILLED DINOSAURS. A. *Psittacosaurus mongoliensis* (AFTER OSBORN). SKULL WITHOUT CREST. FROM THE CRETACEOUS OF MONGOLIA. B. *Protoceratops andrewsi* GRANGER AND GREGORY. SKULL WITH OCCIPITAL CREST. NO HORNS. C. *Triceratops prorsus* MARSH. SKULL WITH HUGE OCCIPITAL CREST AND BONY "HORNS" ABOVE EYES AND NOSE.

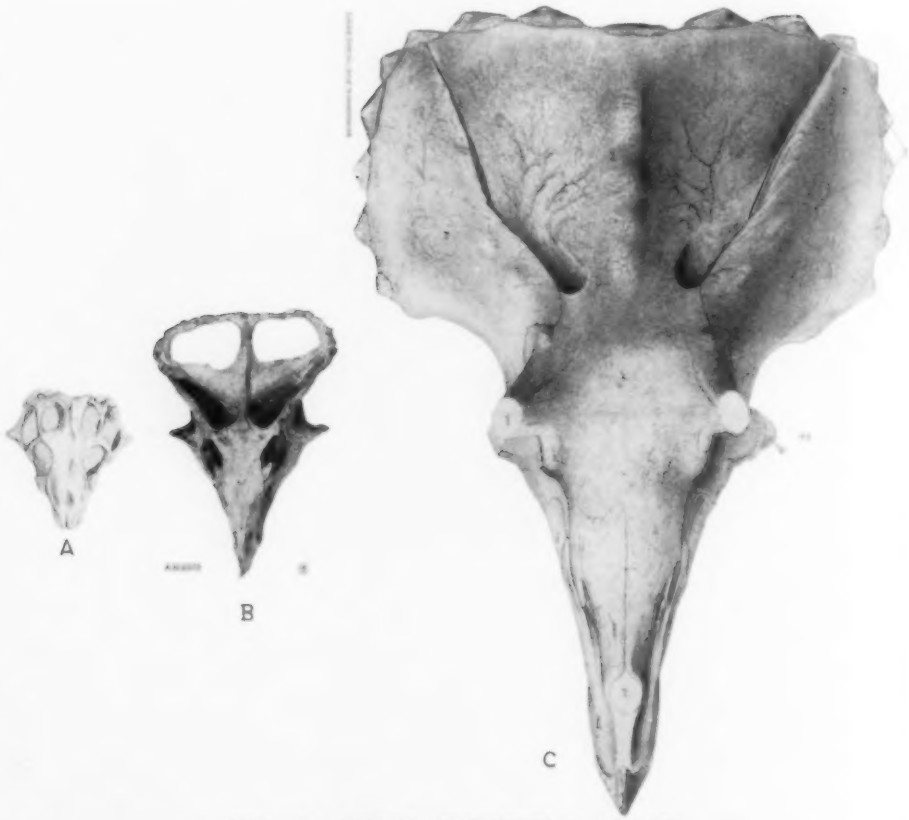


FIG. 10. THREE STRUCTURAL STAGES

IN THE EVOLUTION OF THE OCCIPITAL CREST IN DINOSAURS. A. *Psittacosaurus mongoliensis* (AFTER OSBORN). CREST INCIPIENT. B. *Protoceratops andrewsi*. CREST WELL DEVELOPED. C. *Triceratops ceratus* MARSH. CREST ENORMOUS.

and an enlarged bony scaffolding for the jaw muscles.

Several other kinds of small dinosaurs inhabited the Gobi region in those far-off days of *Protoceratops* and left their skeletons to puzzle the paleontologists that found them. One small light-limbed dinosaur skeleton was found buried in sand in close proximity to a nest of *Protoceratops* eggs and it was suggested that this dinosaur had been overtaken by a sandstorm in the very act of robbing the nest, but this idea has been gravely questioned by the geologists. Professor Osborn therefore named it *Oviraptor philoceratops*, signifying "egg seizer, fond of *Protoceratops* eggs," but at the same time warns us that this name may entirely mislead us as to the true feeding habits, which are difficult to infer with certainty. The skull is very peculiar, being a toothless derivative of an originally carnivorous type, with the stout jaws much shortened in front of the large eyes. Possibly the jaws were sheathed in a horny covering or beak. The animal, however, did not belong to the "beaked dinosaur group," the skull being built upon a widely different plan, fundamentally similar to that of the small bird-like dinosaurs of North America. The animal was a swift-running

biped with a very long second finger on the hand, again recalling that of the American bird-like dinosaur *Struthiomimus* and raising one of the still unsolved problems as to the habits of these strangely bird-like dinosaurs.

Another very small dinosaur has a very lightly built but well braced skull about seven inches long with long jaws armed with sharp cutting teeth. The claw of the first finger of its hand was very large and sharp, like a falcon's claw, and the animal was doubtless a swift-running biped. It was named *Velociraptor mongoliensis* by Professor Osborn. In another small dinosaur, named by Professor Osborn *Saurornithordes mongoliensis*, the skull was so bird-like in appearance, except for the presence of teeth, that when found in the field it was thought to be a bird skull. These dinosaurs are far too late in geological time to be the true ancestors of birds, but with their almost wing-like hands and lightly built skulls they merely parallel the actual ancestors of birds.

Another reptile that was a neighbor of the *Protoceratops* was a small crocodilian described by Dr. Mook, which apparently represents a new genus and species, possibly even a new family of this interesting order of reptiles. The crocodile order is the only existing one that is at all nearly related to the dinosaurs. Thus the popular idea that dinosaurs are giant lizards is true only in the widest sense.

At Iren Dabasu in western Mongolia the explorers discovered the incomplete skeleton of a beaked dinosaur of the duck-billed group of North America. This skeleton is now being studied by Mr. Barnum Brown, of the American Museum of Natural History. In some respects it is related to some of the crested dinosaurs of the duck-billed group. In other respects it is peculiar.

Thus all the dinosaur groups known from the Cretaceous of North America have representatives also in Mongolia, but none of the Mongolian forms appear to belong to exactly the same species as any hitherto-known dinosaurs of Europe or North America. It is too early to attempt a final appraisal of the faunal relations of Mongolia, but at least we may be sure that its extinct reptilian faunae had some vital connection of relationship and derivation with those of Europe and North America.

THE PROGRESS OF SCIENCE

THE PHILADELPHIA MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

EDITED BY DR. E. E. SLOSSON
Science Service, Washington, D. C.

THE American Association for the Advancement of Science held its first meeting in Philadelphia in 1848. The fifth meeting in that city, held during convocation week—usually the week in which New Year's Day falls—was one of the most successful and largest in the history of the association. Some forty scientific societies met in affiliation with the association; some 1,500 papers were included on the scientific programs, and the total attendance was probably considerably in excess of five thousand.

The meeting was held under the presidency of Dr. L. H. Bailey, eminent systematic botanist and editor of our most useful books of reference on cultivated plants and rural life. Dr. Bailey was president of the International Congress of Plant Sciences, held last August in Ithaca, N. Y., and he holds the presidency of the Botanical Society of America. The retiring president of the association is this year Dr. Michael I. Pupin, of Columbia University, known to all scientific men for his research and inventions in electro-physics and to a wide public for his autobiography, "From Immigrant to Inventor." Dr. Pupin delivered the address of the retiring president on the evening of Monday, December 27, at the opening of the meeting, the subject being "Fifty Years' Progress in Electrical Communication."

Numerous other general sessions of the association and meetings of general interest were held during the week. The annual lecture before the Society of the Sigma Xi was given by Mr. Herbert Hoover, secretary of commerce, who spoke on "The Nation and Science." Dr. George F. H. Nuttall, professor of biology in the University of Cambridge, gave an illustrated lecture on the University of Cambridge, and Dr. J. H. Myres, professor of classical archeology at the University of Oxford, general secretary of the British Association, lectured on "Geographic Conditions of Ancient Greek Culture." Among the numerous sessions of general interest was one on research in colleges and professional schools arranged by the Committee of One Hundred; one on the relation of science to education, under the auspices of the American Association's committee on this subject; one on hydrobiology; one on quantitative methods in biology; one on growth in health and disease; one on the biological aspects of medical problems, and one on law enforcement.

Dr. A. A. Noyes was elected president of the association, there being two other living chemists who have held this honor, Dr. Ira Remsen, president emeritus of the Johns Hopkins University, and Dr. Theodore W. Richards, professor of chemistry at Harvard University. Dr. Noyes has been director of the Gates Chemical Laboratory at the California Institute of Technology since 1920. Previous to that time he had been director of the research laboratory of physical chemistry at the Massachusetts In-

PROFESSOR ARTHUR A. NOYES

ELECTED PRESIDENT OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AT THE PHILADELPHIA MEETING.

DR. LIBERTY HYDE BAILEY AND DR. MICHAEL I. PUPIN

DR. BAILEY (WHO STANDS ON THE LEFT) PRESIDED OVER THE PHILADELPHIA MEETING OF THE AMERICAN ASSOCIATION; THE ADDRESS OF THE RETIRING PRESIDENT WAS GIVEN BY DR. PUPIN.

stitute of Technology, where he had also been for two years acting president.

Dr. Noyes was born at Newburyport, Mass., in 1866. His education began at the Massachusetts Institute of Technology, where he received his bachelor's degree in 1886 and his master's degree a year later. He went to Germany for his Ph.D., which he received at Leipzig in 1890. He holds honorary degrees from the University of Maine, Clark University, the University of Pittsburgh, Harvard University and Yale University.

Dr. Noyes was long a member of the executive committee of the American Association; he represents the National Academy of Sciences upon the board of trustees of Science Service; he was president of the American Chemical Society in 1904 and received its Willard Gibbs medal in 1915. The chemical research which has given Dr. Noyes distinction covers a wide field, including the rare elements, thermodynamic chemistry, the ionic theory and class reactions for the identification of organic compounds.

"The day of genius in the garret has passed, if it ever existed," said Secretary Herbert Hoover in addressing the honorary scientific society Sigma Xi. Now-a-days, as he pointed out, "discovery must be builded upon a vast background of scientific knowledge, of liberal equipment. It is stifled where there is lack of staff to do the routine, and valuable time must be devoted to tending the baby or peeling potatoes or teaching your and my boys. The greatest discoveries of the future will be the product of organized research free from the calamity of such distraction. Yet the whole sum we have available to support pure science research is less than ten million a year with probably less than four thousand men engaged in it." But in the application of science to industry we are spending probably two hundred million with perhaps thirty thousand men engaged. Yet fundamental research in pure science is the basis of its applications. "Faraday in the pursuit of fundamental law discovered that energy could be transformed into electricity through induction. It remained for Edison, Thomson, Balle, Siemens and many score of others to bring forth the great line of inventions which applied this discovery from dynamo to electric light, the electric railway, the telegraph, telephone and a thousand other uses which have brought such blessings to all humanity. It was Hertz who made the fundamental discovery that electric waves may traverse the ether. It was Marconi and De Forest who transformed this discovery into the radio industry. It was Becquerel who discovered the radio activity of certain substances and Professor and Madame Curie who discovered and isolated radium. It was Dr. Kelly who applied these discoveries to the healing art and to industrial service. It was Perkins who discovered the colors in coal tar by-products. It was German industrial chemists who made the inventions which developed our modern dye industry. It was Pasteur who discovered that by the use of aniline dyes he could secure differentiation in colors of different cells, and this led to the discovery of bacilli and germs, and it was Koch and Ehrlich who developed from this fundamental discovery the treatment of disease by antitoxins."

"Much of the peculiar quality of Greek civilization depends upon the interaction of the mountains and the sea; much also depends on the composition and structure of the mountain masses themselves." This was the main theme of the public address given by Dr. J. L. Myres, general secretary of the British Association for the Advancement of Science. Ancient Greek culture developed in a region of half-submerged mountains forming an exceptionally complex type of scenery of islands, bays and promon-

tories. The Greeks had marble, copper, iron and gold, but almost no coal, and this permanent shortage of power in the Greek world has its reflection in Greek civilization in the constant shortage of labor and the prevalence of slavery. Grains were precarious and the only secure crops were from deep-root trees like the vine and olive. "Under these conditions industrial activity was possible locally with the two main industries—textiles based on the wool of the pastures and hardware of various kinds derived from the mineral resources of the old crystalline rocks. In times of danger from continental land powers the Aegean settlements shrank to the sea-front of all promontories and in-shore islands. On the other hand, in time of danger from sea-pirates, the settlements withdrew from the sea on to high ground wherever possible. When sea piracy is eventually reduced in extent under new control of organized sea powers elsewhere, for example by Rome and by France and England in modern times, the hill villages spread once more down to the sea coast."

Mathematics lies at the basis of all the other sciences and a science is regarded as becoming most scientific when it can be treated by mathematical methods. Astronomy and physics reached the mathematical stage first, chemistry is rapidly following suit and recently biology and psychology are making use of mathematics. On account of the fundamental importance of mathematics any advances in this field are welcomed by investigators in every field of research. Consequently it is not surprising that the thousand-dollar prize offered for a notable contribution to the sessions of the American Association for the Advancement of Science has been awarded this year to Professor G. D. Birkhoff, of Harvard University, for his presidential address before the American Mathematical Society entitled "A Mathematical Critique of Some Physical Theories." Only professional mathematicians will understand its significance, so all that can be done here is to show what the paper is about and why it is considered important by experts. Geometry was developed into a perfect logical system by the Greeks and until the nineteenth century was taught exclusively as the last work in this science. But recently it has been found possible to develop other systems of geometry, equally consistent within themselves. This raised the question whether the Euclidean geometry or some of its newer rivals, the non-Euclidean geometries, best fitted the world as it is. When Einstein pointed out that the non-Euclidean geometry gave a better explanation of other physical phenomena, mathematicians plunged into the new field with greater zest. Professor Birkhoff has taken a step beyond Einstein. He accepts the four dimensional view of space and time embodied in the theory of relativity as "reasonably correct qualitatively" but points out that no way has yet been found to account for all the lines of the spectrum of light, which are ascribed to the frequency of vibration of various parts of the atom. The atom was formerly regarded as simple, but is now-a-days regarded as composed of positive and negative electrical particles, called protons and electrons, the unlike bodies attracting and the like bodies repelling each other. But Professor Birkhoff proposes the use of a new type of elastic body and the "new assumption that the electrical forces between the charges on one and the same proton or electron are attractive instead of repulsive." The laws of space and time in the atomic domain seem irreconcilable with the known statistical laws that can be directly verified, but he hoped that "the mathematicians would develop various types of mathematical universes which might subsequently be of aid to the physicist."

The universe may be infinite in extent,

Dr. Heber D. Curtis, director of the Allegheny Observatory of the University of Pittsburgh, pointed out in his address. Once it was believed, he said, that if the stars were uniformly distributed throughout space without end, the night sky would appear continuously as bright as the sun, and that somewhere in this universe speeds of the bodies would be infinite, presumably an impossibility. The theory of relativity supplied one answer to this by suggesting that the universe is a limited amount of space, yet without any definite boundary, similar to the surface of a sphere, where a particle could travel indefinitely without ever coming to an end, but would also be in a definitely limited amount of space. According to Dr. Curtis, however, the universe could be infinite, and if the stars were not distributed uniformly, but in groups, the difficulties of a bright night sky, and of infinite speeds, would not occur. This is the way the universe is actually constructed, he said, for our groups of stars, or galaxy, is a watch-shaped cluster, and outside its boundaries, scattered throughout space, are millions of spiral nebulae, which have been shown to be other galaxies of stars.

Now that the atomic theory has been applied to light the next question is to determine the size of the individual atoms or quanta of which a beam of light is thought to be composed. No one has yet found out how small they are, but E. O. Lawrence and J. W. Beams working at Yale have found how big they are not. They have invented a shutter of such almost incredible quickness as to cut a ray of light into segments or pulses of only three inches in length, although light travels at the rate of 186,000 miles a second. Yet each of these flashes lasting less than a ten billionth of a second is sufficient to register its effect upon their extremely sensitive photo-electric cell. So the unit of light, whatever it is, must be shorter than that.

A new investigation of a radio death-force was reported to the American Association for the Advancement of Science by Professor R. W. Wood, of the Johns Hopkins University, and A. L. Loomis, of Tuxedo, N. Y. They arranged two metal plates a couple of inches apart, and connected them with an electrical oscillator like the ones used in radio sending sets but much smaller. This drives into the plates an intense electric current, alternating at the rate of approximately one hundred million times a second, and giving rise to extremely short radio waves, about three meters long. A mouse placed between the plates, though not touching either one of them, was killed by the intense electromagnetic field. It died in about half a minute, and its blood was found to be coagulated in its veins. A test tube containing several insects was next tried. The insects were likewise quickly killed, and their bodies became dry and brittle. Professor Wood stated that the experiments were begun only recently and that the near future is likely to bring some startling results, but he pointed out emphatically that a devastating death-ray to kill at great distances is not to be looked for from this apparatus.

The direct measurement of the inherent vitality of any kind of living being is the novel and ambitious undertaking of Professor Raymond Pearl, director of the Johns Hopkins Institute for Biological Research. He has applied his method to two widely different types of creatures, one in the animal and the other in the vegetable kingdom, the fruit-fly and the canteloup. He found the same distribution of individual differences in the duration of life of the insects deprived of food and in the sprouting of the melon seeds also without external nutrition.

The sexes are distinguished throughout the animal and vegetable kingdom,

PAST PRESIDENTS OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

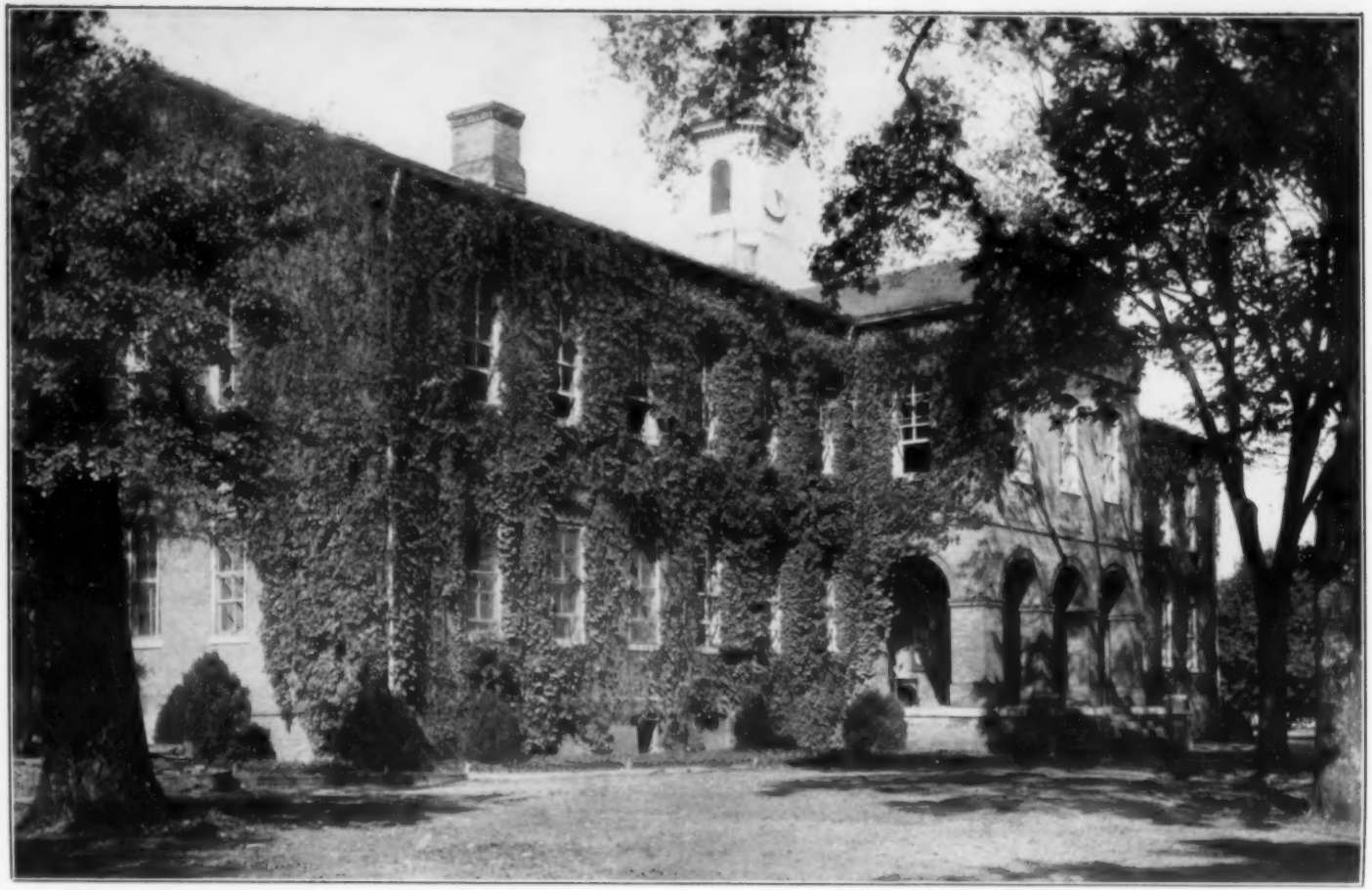
THE PHOTOGRAPH TAKEN AT THE PHILADELPHIA MEETING SHOWS ABOVE, FROM LEFT TO RIGHT, PROFESSOR KNIGHT DUNLAP, THE JOHNS HOPKINS UNIVERSITY; PROFESSOR RAYMOND DODGE, YALE UNIVERSITY; PROFESSOR LEWIS TERMAN, STANFORD UNIVERSITY; BELOW, FROM LEFT TO RIGHT, PROFESSOR JOSEPH JASTROW, UNIVERSITY OF WISCONSIN; PROFESSOR CARL E. SEASHORE, UNIVERSITY OF IOWA; PROFESSOR HOWARD WARREN, PRINCETON UNIVERSITY; PROFESSOR MARGARET FLOY WASHBURN, VASSAR COLLEGE; PROFESSOR R. S. WOODWORTH, COLUMBIA UNIVERSITY.

PROFESSOR JOSEPH JASTROW, UNIVERSITY OF WISCONSIN; PROFESSOR CARL E. SEASHORE, UNIVERSITY OF IOWA; PROFESSOR HOWARD WARREN, PRINCETON UNIVERSITY; PROFESSOR MARGARET FLOY WASHBURN, VASSAR COLLEGE; PROFESSOR R. S. WOODWORTH, COLUMBIA UNIVERSITY.

not only by form and function, but by the chemical composition of every drop of blood or sap. The test tube reaction proving this, devised by the Russian Manoilov, has been simplified and made more precise by Sophia Satina and A. F. Blakeslee, of the department of genetics of the Carnegie Institution of Washington. The substances responsible for the reaction are sufficiently stable toward heat so they may be identifiable and they appear to be sugars similar to glucose. The extent of difference between the sexes in the physiological processes so measured depends upon the stage of life. In the case of flowering plants the leaves collected three or four weeks after flowering are most easily distinguishable as to sex by such means while the leaves gathered in the midst of the flowering period are so much alike in this respect that they can not always be distinguished by chemical means and indeed sometimes give the reaction of the opposite sex. In the case of bread moulds, where the opposite sexes are impossible to determine except by this test, the greatest difference is shown in well-developed culture of nine days old and is least apparent in older and younger. Dr. W. L. Aycock, of the Harvard Medical School, reported to the American Society of Bacteriologists that artificial immunization against infantile paralysis was accomplished in monkeys in about one third of the cases treated. Dr. Aycock and Dr. J. R. Kagan treated weakened strains of the causative virus with glycerine and carbolic acid in preparing the vaccines used. The immunized monkeys were able to withstand successfully injections of the active virus when the series of protective vaccination were completed.

Diabetes may be due to infection by a virus too elusive to be discovered by the microscope. This is the inference of experiments on the cause of this dread disease reported by Dr. D. H. Bergey, of the University of Pennsylvania. He has found it possible to induce the disease by injecting rabbits with urine from a diabetic patient after filtering it through porous porcelain. This would indicate that diabetes belongs to that class of diseases caused by infection with a germ or virus so extremely minute that it can not be discerned with the most powerful microscope or caught by the finest filter. Yet Dr. Bergey shows that the diabetes virus can be cultivated and developed on serum broth when air is excluded, and after fifty-six hours is more potent than before in infecting rabbits. The discovery of this method of handling the causative agent of this mysterious malady promises to lead to methods of counteracting it or preventing its spread. Diabetes is one of the diseases which continues to increase in spite of the success of experimental medicine in other fields. The death rate from this disease more than doubled in the twenty-four years preceding 1923. Injections of insulin, the missing hormone, may prolong life indefinitely but neither the cause nor the cure has so far been discovered.

Dr. Aleš Hrdlička, president of the American Anthropological Association, subjected to sharp criticism the frequent reports appearing in the newspapers of finds of the remains of fossil man in America. The stories of the discovery of bones of prehistoric dwarfs or giants are obviously absurd and even the most plausible of such announcements lack substantial foundation. The sensational report by a curator of a western museum of rock carvings of man in company with extinct lizards and elephants was wholly erroneous. The row of teeth found in a slab of hard rock of Eocene Age and pronounced by one of the foremost dental journals to be human was found on closer scrutiny to be those of an ancient horse. There is no decisive evidence of the existence of man in America as early



THE SIR CHRISTOPHER WREN BUILDING OF WILLIAM AND MARY COLLEGE

THE OLDEST ACADEMIC HALL IN THE UNITED STATES ERECTED IN 1693 AFTER THE COLLEGE HAD RECEIVED ITS ROYAL CHARTER FROM KING WILLIAM AND QUEEN MARY. THIS BUILDING STILL SERVES AS AN ACADEMIC HALL AT THE COLLEGE. IT WAS HERE THAT JEFFERSON, TYLER, MARSHALL, WYTHE AND OTHERS RECEIVED THEIR EARLY EDUCATION.

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THE PHI BETA KAPPA MEMORIAL HALL OF WILLIAM AND MARY COLLEGE

ERECTED ON THE CAMPUS TO SERVE AS A MEMORIAL TO THE FIFTY FOUNDERS OF THE GREAT SOCIETY WHICH HAD ITS BEGINNING AT WILLIAM AND MARY IN 1776. THIS BUILDING CONTAINS, AMONG OTHER FEATURES, A REPLICA OF THE APOLLO ROOM OF THE HISTORIC RALEIGH TAVERN OF WILLIAMSBURG, WHERE THE IDEA OF PHI BETA KAPPA WAS FIRST CONCEIVED. IT WAS DEDICATED ON NOVEMBER 27. DR. CHARLES F. THWING PRESIDED, AND AMONG THE SPEAKERS WERE DR. HENRY VAN DYKE, DR. JOHN ERSKINE AND DR. JOHN H. FINLEY.

BRAFFERTON HALL OF WILLIAM AND MARY COLLEGE

USED AS THE FIRST INDIAN SCHOOL IN THE UNITED STATES. ERECTED IN 1723 FROM FUNDS SECURED FROM THE ESTATE OF SIR ROBERT BOYLE, THE PROMINENT ENGLISH SCIENTIFIC MAN, WHO SET ASIDE A PORTION OF THE REVENUE DERIVED FROM HIS ESTATE, BRAFFERTONSHIRE, TO BE USED IN CONNECTION WITH THE COLLEGE OF WILLIAM AND MARY.

as the Glacial epoch or even of the arrival of any men, except the Indian and Eskimo, coming from other continents before Columbus.

Settlements of the men of the Old Stone Age found in southwestern Siberia were reported by Waldemar Jochelson, professor of ethnology at Leningrad University, now in the United States writing a book on the archeology of Kamchatka for the Carnegie Institution of Washington. He believes that in Manchuria, Mongolia and Siberia, the late Stone Age passed directly over into the Iron Age without passing through the Bronze Age which intervenes in western Europe.

Boys in Boston are taller than they were fifty years ago. Dr. Horace Gray, of the Chicago Institute for Juvenile Research, reported a comparison of the heights of boys of American-born parentage from six to eighteen years old measured by Bowditch a half century ago with those of the same age and parentage now, and he finds that in every year the modern boys are taller than those of the earlier generation. The gain in height varies with the age from 2.4 to 3.8 inches, averaging 3.2 inches. Dr. Gray ascribes the gain chiefly to progress in control of infantile diseases which so frequently damage growth and to knowledge of vitamins, sunlight and rickets with consequent better nurture.

The slight artistic deviations from the regular that bring beauty in music can be measured and charted by a phonophotographic method of music notation devised by Dr. Carl E. Seashore, of the University of Iowa, and demonstrated before the association. Ordinary notes are crude and inaccurate compared with Dr. Seashore's mechanically recorded curves that measure the tenderest emotion in music or speech. Even differences in mood of the singers are rigidly recorded by Dr. Seashore's charting of the actual sound waves, and collectors are using his method in recording primitive music for posterity.

Action in defense of freedom of speaking against governmental interference was taken at the American Association of University Professors meeting in affiliation with the American Association for the Advancement of Science. The report on "Freedom of Teaching in Science" by Professor S. J. Holmes, of the University of California, excited a lively discussion as to the best method of resisting such encroachments upon the rights of the teaching profession. Attention was called to the fact that in seventeen states bills will be presented to the legislatures this year similar to the North Dakota bill which provides that no theories shall be taught contrary to the biblical statements of the origin of man.

The association passed a resolution presented by Professor A. A. Lovejoy, of Johns Hopkins University, authorizing the Council of the American Association of University Professors and inviting other interested agencies to form an association for the maintenance of freedom of teaching in science. This organization would do all in its power to educate the public as to the danger of letting state legislatures restrain the teaching of the sciences and strive for a clean-cut division between church and state in this matter. The association also voted for an investigation of the legality of the action of the Texas State Text-book Commission in striking out "evolution" from the school books.

CORRECTION: In the article on "The Passing of the Professor" published in the January issue of THE SCIENTIFIC MONTHLY, it was incorrectly stated that the Reverend William Sunday had been "created a doctor of divinity by the University of Pennsylvania." The institution that conferred the degree on Mr. Sunday was Westminster College, Pennsylvania. The error may have been caused by widespread publicity given some years ago to an address by Mr. Sunday at the University of Pennsylvania.